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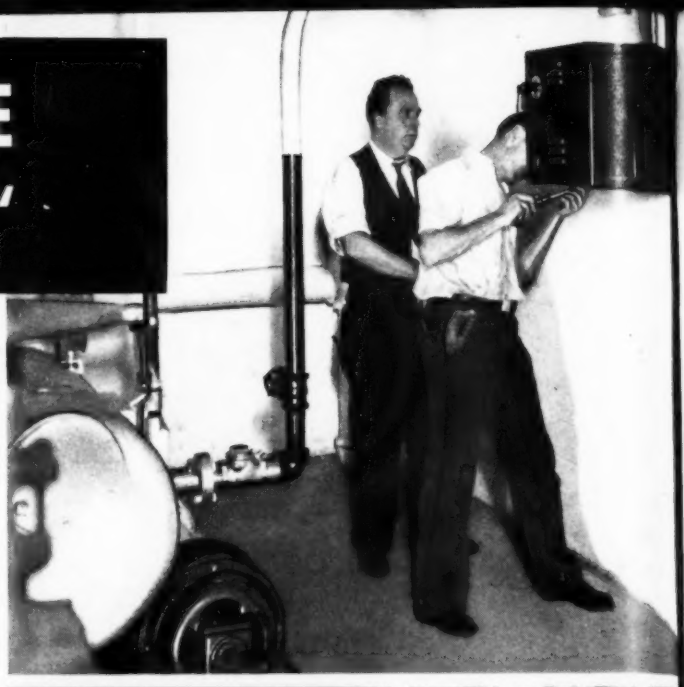
HE REALIZES THE IMPORTANCE OF "IC"



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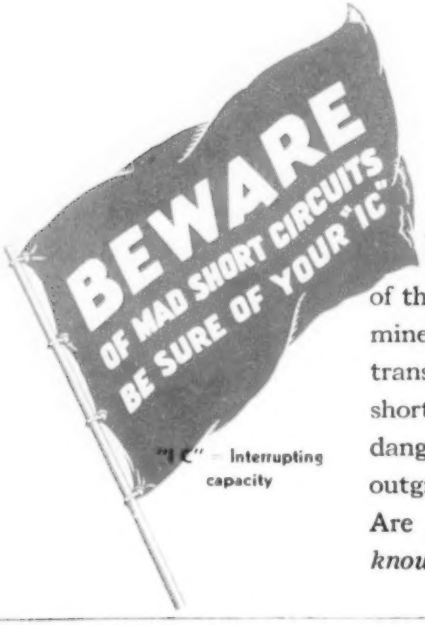

THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They gravely endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices. Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

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— one that INSURES a low resistance path to ground.

IT MUST BE RIGHT!

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Research and experiment showed that by tightening the interlock of the convolutions, resistance was lowered but rigidity increased, whereas the whole point of armored cable is its flexibility. Further experiment showed that while coil tests showed fairly low resistance, installation tests revealed a marked increase in resistance, due to flexing of the cable. This led to Triangle's definite conclusion that for complete and unvarying protection the convolutions must be bonded together. Beginning December 1st, Triangle goes into production of that form of cable.

Triangle Double Bushed and Bonded Armored Cable accomplishes this necessity by means of a tinned copper wire BRIDGING EACH CONVOLUTION. This is a bond wire — not a ground wire — and cannot be confused as a third leg or a neutral.

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BOND WIRE

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Tear off the paper and snip the bond wire and there you are! — Double bushed and bonded where protection is most needed.

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electrical contracting

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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Make it happen to you!

Contractor discovers low-voltage condition...wins $13,000 rewiring contract

"No work today—the feeder blew!"

THIS man could be the employee of any one of the nine out of ten plants in the country that are today inviting electrical failures and subsequent shutdowns. How come? Simply *because they are unaware of their plant's electrical condition.*

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ANACONDA

Checking up on wire and cable insulations with compact megger. Equipment like this can help you make money. Photo courtesy James G. Biddle Co.

In making a wiring survey in the plant of a large industrial concern this contractor found a serious and costly low-voltage condition. It was caused, he found, by gradual expansion of production requirements. He recommended a specific plan to increase electrical capacity. As a result, he got a contract for capacitors and a new wiring system that amounted to slightly less than $13,000. The plant benefits were equally as large—production increased, of course, and *$1200 saved every month* through reduced power losses was enough to pay for the investment the first year.

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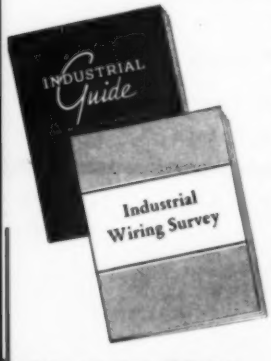

The two books shown here can be obtained from your regular Anaconda distributor. They give complete directions for making plant wiring surveys ...provide a step-by-step guide for making a general survey on wiring, motors and lighting...a report section listing conditions found in each feeder, subfeeder and branch circuits . . . recommendations for plot sketches and plans of existing wiring system layout. Ask your Anaconda distributor for your copies today. 89810

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DECEMBER, 1939

A Tip from Socrates

SLEEPING SWEETLY IN MY PALE PINK PAJAMAS, the other night, I had a strange dream. Socrates, the human question mark of Greek philosophy, drifted in through my window and, perching on my bed post, regarded me with a baleful eye. The following discourse ensued—

OLD SOC—"What's the matter with you electrical men? To save a trifle, you argue for years over making wire a little thinner. Why don't you cut out excess varieties of all your wiring materials? You don't need half the outlet box sizes or black conduit, do you? When you bring out new materials, why don't you retire the old ones? And how about the 57 varieties of power company service equipment?

E. W.—"I don't know, sir."

OLD SOC—"If wiring systems are over loaded in commercial buildings, why don't you throw out mazda lamps and put in fluorescent lighting everywhere and reduce the consumption and restore the voltage and let 'em have more light now without waiting to rewire everything?"

E. W.—"I don't know, sir."

OLD SOC—"And why don't you develop a fluorescent lamp with an Edison base—maybe a cone shaped spiral tube with the ballast inside the cone—so it can be used in houses and reduce consumption there and restore voltage, while you are finding out how to sell adequate wiring to old homes?"

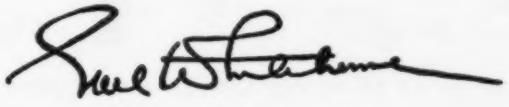
E. W.—"I don't know, sir."

OLD SOC—"And why don't your power companies make the cost of current less by saving all the expense of meters and meter testing and meter reading and kilowatt accounting and monthly bills to twenty million homes?"

E. W.—"How, sir?"

OLD SOC—"Why don't you use your head? With your small circuit breakers to control demand, why can't you sell electric service according to the customers maximum demand? Kilowatts cost only a few mills. What power companies want to sell is their capacity. Put the electric water heater on a time switch. Let 'em use all they want up to the demand they pay for. Then a circuit will trip and they will turn something off. Bill 'em quarterly and stagger the bills and the company will get a regular income, month by month. You will save millions and make electric service cheaper, so people can use more of it. Why not?"

SOCRATES SMILED and nodded his head and winked at me. He was pleased with his idea. But a cynical owl on the oak outside, hooted three times. Old Soc shuddered and dived through the window. As for me, my head went round and round, because I knew the old guy was right.



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He's been meeting electrical contractors' needs for 24 years

The average experience of Graybar managers, service managers, and supply department managers is 24.13 years.

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The long experience of Graybar men results in frequent savings of time, energy, and money for our contractor customers. Whenever we have an opportunity to become better acquainted with the specific needs of individual customers, even more conveniences and savings are made possible. Our entire organization is geared to properly meet the needs of Electrical Contractors.

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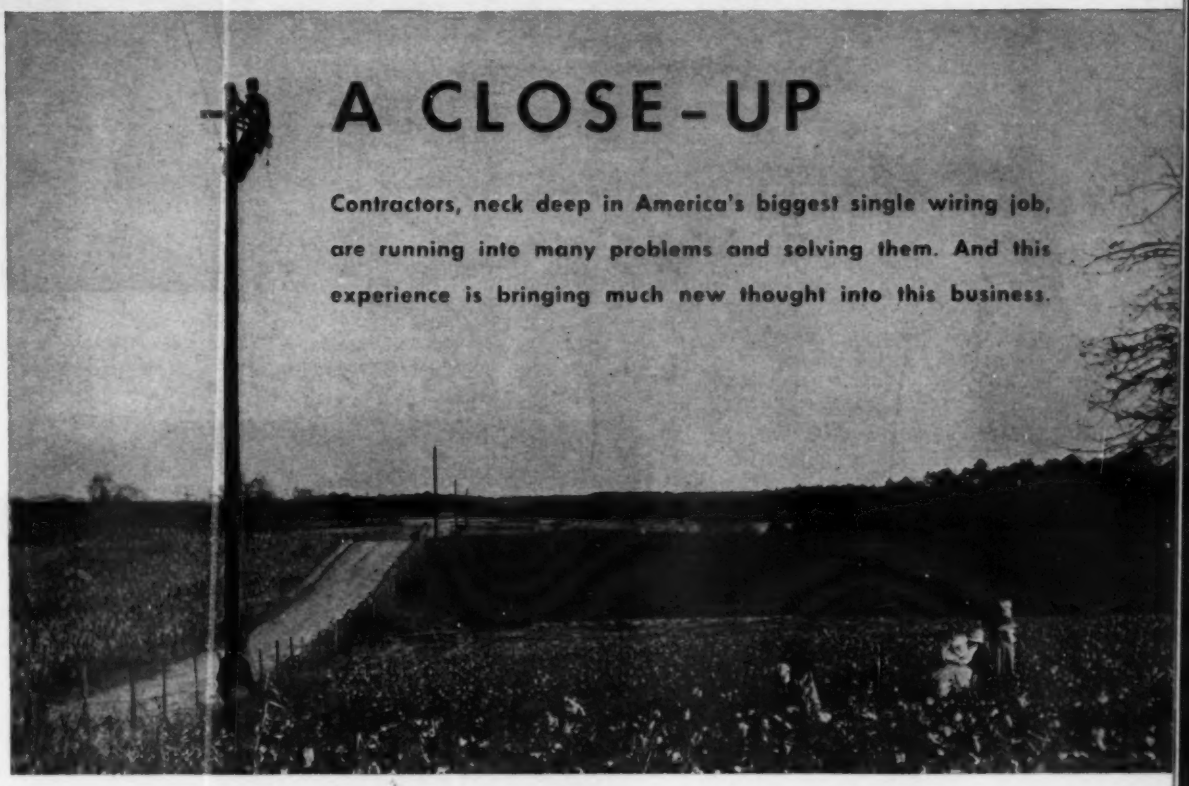
Rural Electrification...



A CLOSE-UP

Contractors, neck deep in America's biggest single wiring job, are running into many problems and solving them. And this experience is bringing much new thought into this business.

By W. T. STUART

RURAL lines built in 1939 will reach an estimated total of 130,000 miles. In round numbers, it will bulk $120,000,000 worth of line construction. To that add $40,000,000 for farm wiring, then $60,000,000 for appliances, to get a quick picture of what rural electrification now means to the electrical industry.

The big figures represent an accumulation of neighborhood jobs, handled by thousands of individual contractors. For, even though rural electrification is national in scope and similar problems spring up in a dozen states at one time—practically, each segment of this nationwide job is as local as a county fair.

A typical project is the Corn Belt Electric Cooperative in Illinois. It covers McLean County and adjoining territory in Woodford, Tazewell, DeWitt, Logan, Champaign and Ford counties. It was incorporated on September 22, 1938, when a thousand farmers and their wives gathered in the Bloomington High School and voted unanimously to support a project.

The Board of Directors appealed to Washington for an allotment based upon an analysis by Michael Drazen, St. Louis engineer, and T. H. Hafer, project superintendent, of Bloomington. They asked for a loan of $1,164,000 to build 1,146 miles of line to serve 3,481 customers.

They got their money and line construction contracts were let. A contract was made with the Illinois Iowa Power Company for current to be delivered through six sub-stations.

Contractors and electricians from the project area and surrounding counties were called in to a meeting to set up wiring plans. Standard prices were agreed upon for the project, and a standard job specification adopted. Everyone who wanted to wire farms, connected to the cooperative line, was required to fill out a qualification form outlining his experience and responsibility. From these a list of approved contractors and electricians was made.

In July 1939, the approved list contained 91 names, all contractors or electricians within a 100 mile radius of Bloomington. Some were dealers who assumed contracts for the material sale, letting the installation to other approved electricians. Sears Roebuck and Montgomery Ward were among this group. Less than one in a hundred jobs were installed by other than the electricians on the approved list. And this included owners who do their own work.

Most of the jobs used non-metallic sheath cable, had 60 ampere services as a minimum, and No. 12 wire for first floor circuits. Article 2100 of the National Electrical Code has been revised for the project, to permit two plug receptacles per room, instead of the 10 foot rule.

The history of "Corn Belt" is typical of most of the rural cooperatives organ-

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ized during the last 18 months. Much has been learned from the experience of earlier cooperatives. For instance—

The farmers are being discouraged from doing their own wiring and urged to have it installed by a contractor selected from the approved list.

Rigid inspection is required and no customer will be connected without a certificate.

It is recognized that adequate wiring properly installed is vital to the economic health of the project. Today any electrician who consistently does substandard work finds himself quickly removed from the approved list.

It wasn't always that way. Rural electrification has come up a long hard road, from the days when spellbinders predicted $25 wiring jobs.

In the early days of REA, under the spell of the cooperative idea, farmers were urged to do their own wiring. Schools were set up to teach the farm boys how, and cooperatives bought material directly from the manufacturers. They sold it to the farmers at cost.

When inspection facilities were established under pressure from Washington, much dangerous and defective work was uncovered. Cooperatives therefore set out to attract competent electricians.

But the Messianic fervor of cooperative leaders, the enthusiasm of cloistered agriculturalists from state universities and the blue sky philosophy of the cooperative idea was not an easy thing for more sober heads to slow up. Too many slogans had been bandied about.

—"Wiring is easy"

—"There aren't enough electricians in the whole state to handle this one project"

—"Send your boy to school for a couple of weeks and we'll make him an electrician"

—"Do your own wiring, We'll show you how"—

It was all very simple and easy to do. To folks who had no experience with electricity, it sounded perfectly logical.

In Indiana, cooperative wiring schools trained 40 to 50 farm boys on two projects in an intensive course lasting about two weeks. They started them out at 40 cents an hour, working under the supervision of their instructor and the project inspector. But, the work required too much supervision. Most of the boys dropped out after they had wired their own properties.

Then Purdue University took up the training of some young men in a brief summer course. But the farmers were already using experienced wiremen.

In Iowa, similarly trained young men were sent out by the cooperatives to do wiring at a cost of 60 cents per outlet. The farmer purchased his own materials from the cooperatives at a cost plus ten per cent. This also fizzled because the boys were dissatisfied with the amount of money they could make at this rate of pay. The cooperatives, in turn, learned the economic fact that a wiring supply business cannot exist on a ten per cent mark up.

Inspectors are still contending with amateur wiring. An Indiana inspector lists the following defects common to these jobs. Any or all of which he expects to find when the farmer tells him, "I did the job myself"—

NIGHT WORK—*Some of it still is put in by a neighboring mechanic after hours but inspectors are discouraging it. (REA Photo).*

NEW COMFORTS—*An appliance demonstration shows these country people in Illinois what electricity will do for them.*

1. *Short leads.* Leads at switch boxes extend a bare two or three inches from the connector.

2. *Small splices.* Lead ends are stripped about one-half inch. The short twist will not stand mechanical strain.

3. *Cold soldering.* Many solder joints with so-called liquid solder, which is not a conductor of electricity. Others flow solder onto the joint from a soldering iron, leaving the joint cold and the solder adhering lightly to the surface.

4. *Poor clamping.* Cables are often run exposed in the basement and attic, held in place with bent nails, tied up with baling wire or hanging loose between outlets.

5. *No connectors.* Cables are often brought into boxes by simply threading them through a knock-out without any type of connector. This defect is common on both non-metallic sheath cable and armored cable jobs.

6. *Improper box mounting.* Outlet boxes are wedged into tight fitting holes without fastening. If the hole is too large the box is plastered in.

7. *Hidden joints.* The practice of splicing cable between outlets is very common and difficult to detect. This defect in armored cable jobs was caught by checking for continuity of grounds. However, amateur wiremen soon fixed this by connecting the armor with baling wire.

But the inspector has fewer "haywire" jobs to contend with now. And, conditions will undoubtedly continue to improve as cooperatives gain experience. Strict code enforcement has demanded more capable electricians. Better prices have attracted more competent business men into the field.

The Blue Chip concerns, those who have their headquarters in the city and hire union labor, are conspicuously absent from the farm wiring field. I talked with a select list of the most prominent contractors in six Illinois and Iowa cities. And, none admitted any

NON-METALLIC *sheath cable is the popular conductor, and more and more of these jobs are installed by contractors (REA Photo).*

interest in the farm wiring work in their locality. The principal objections were prohibitive labor costs and prohibitive cost of sales.

On the other hand, small town contractors are in rural wiring up to their necks. And like it. They pay wages between 40 and 75 cents an hour, with bonuses to the boys who bring in work. Usually they know their customers, or have mutual friends and personal selling brings in most of the work. Even so, one Eastern Iowa contractor admitted that if he used a strict accounting procedure and charged all his time, nights and Sundays, his selling costs would run better than 25 per cent. As it is, he claims to clear a gross margin of 17 to 20 per cent on the average job.

The rural contractor frequently handles a line of appliances, or acts as an agent for a town appliance house. Appliance houses, in turn, do their best to line up the better wiring contractors as agents. And, the appliance business is looked upon generally as the profitable part of the rural work. The majority of farm wiremen sell and install their own jobs, averaging somewhat less than one job a week.

Occasionally contractors do a mass production job on farm wiring, using advance sales crews and follow-up wiring crews, with jobs handled on a production basis. Outstanding among these contractors is the Westgate Electric Company of Columbus, Ohio, whose crews handle 400 to 500 jobs a month. Westgate makes sure of cooperation from local interests by refusing to handle appliances, directing their customers to local dealers.

Where does the money come from? The cooperative will loan the farmer up to $400 for his wiring installation. This, with the minimum of 20 per cent cash required, takes care of a $500 job. Rules covering the minimum installation that can be financed are—

In living room, dining room, or kitchen there must be installed one ceiling light and two receptacles.

In every room of the house, there shall be installed at least one ceiling light and one convenience receptacle.

There shall be a light and switch for both the front and rear entrance to the house.

Beyond these fundamental rules the wiring jobs must be installed, in accordance with the N.E.C. and the local cooperative standard specifications.

Some Wiring Problems

Farmstead wiring has run into many of the same problems as were experienced with the early wiring of old homes in the city. Outbuilding wiring, however, has introduced new problems peculiar to the farm. Among them these considerations are interesting.

Barns, dairies, stables, have wiring system corrosion problems not normally encountered in city wiring. The ammonia fumes from manure will quickly eat out armored cable and electrical metallic tubing and heavy wall conduit. Conduits of special corrosion resisting material used in industry are excessively expensive and impractical for farm outbuilding work.

Non-metallic sheath cable was soon adopted for outbuilding wiring by rural contractors as a solution to the corrosion problem, and also because of its low cost. However, excessive dampness and winter-time frosting of outside walls raised another serious problem in the use of non-metallic wiring.

In many states and cooperatives, local rules require that non-metallic sheath cable, run on exterior walls of outbuildings, must be supported away from the wall by a distance of about one inch, to allow for frost condensation.

In hay mows, feed storage, tool sheds, and other areas where wiring must pass through at points subject to mechanical damage, rules require a conduit or metallic tubing shield over the non-metallic sheath cable.

The use of protective conduits of this type raises another problem of drainage, particularly in hay mows. Vapor, gathering in the pipe, drains through the relatively warm hay to the cold area below, freezing in the bottom of the conduit. This forms a pocket for the accumulation of condensation.

Grounding, though a relatively simple task in wiring city buildings, becomes a profound engineering problem on the farm. Water system grounding is not permitted, because the water systems found on farms are usually isolated and of questionable earth resistance. Instances are already on record where livestock has been killed by stray currents resulting from grounding lighting systems to dairy barn water systems.

The common practice now followed in most farm areas is a ground at the meter loop pole, and a driven ground consisting of a $\frac{3}{4}$ by 8 foot ground rod at each building.

Variations in soil character make it impossible to set up standards for grounds based on construction. Several rural inspectors have advised the establishment of theoretical resistance standards setting up a minimum ohmic value for the ground system, specifying any kind of grounding material that will stand up.

To the average city electrician the rural electrification program is an isolated phenomena. It has little to do with his business. But make no mistake—the plans, the material, the methods, and the business technique employed by rural contractors are having a profound effect upon the entire electrical industry. It is bringing much new thought into the wiring business.

BIG DAY—*This crowd is watching the energizing ceremonies on an REA project in Georgia, waiting for the orators to start (REA Photo).*

UMI

When You WIRE the CLOTHING FACTORY

The ninth article in a series devoted to wiring reminders for different kinds of plants.

CLOTHING the nation's population requires vast facilities for making billions of garments annually for men, women and children. These factories take woolens; cotton, rayon and other dress goods; denim and other heavy materials, and make it into suits and dresses and other clothing for work and play. So in most of our larger communities one or more factories are to be found engaged in various phases of clothing people. Likewise quite a few small towns depend on garment making for considerable employment.

It is estimated that there are some 3,800 plants in this country devoted solely to making suits, overcoats and topcoats for men and boys. Large numbers of other plants make ladies coats and suits. Still others specialize in dresses. From these basic types of manufacturing the industry divides itself into many branches, such as for work clothing, uniforms, sportswear, rainproof garments, shirts, aprons, children's and infants' wear. In all of these the fundamental operations of cutting, sewing and buttonhole making prevail.

Production in this industry, while considerably mechanized, remains largely a matter of human effort. So employee comfort and correct seeing conditions are most important in the operations that apply to almost any type of "needle trade." This means that efficiency depends on—

1. High standards of illumination.
2. Adequate power facilities.
3. Freedom from interruption.
4. Comfortable room temperatures.
5. Healthful air conditions.
6. Maximum safety to workers.

Interpreted in the electrical contractor's terms, the wiring system ranks high as a means of promoting high standards of efficiency. So in planning the original wiring layout, or in modernizing existing facilities for a clothing or garment factory, these details are important—

1. Lighting layouts that include adequate general illumination and lend themselves to safe and unrestricted use of supplementary equipment.
2. Trouble-free power facilities which will take care of changes in production methods at minimum alteration cost.
3. Step-saving and shock-proof control of all equipment operated by women and other workers not mechanically trained.
4. Convenient facilities to control the circulation of fresh air and room temperature.
5. Elimination of dark passageways and stairs, cords, conduits or other equipment which might trip or otherwise injure employees.
6. Minimized maintenance routine. This is important since few smaller plants keep persons on the premises qualified to do electrical repair work.

So tamper-proof distribution and controls, liberal allowances for circuit and feeder loads, and high grade wiring materials and devices will save money for this type of customer. They will stand the normal abuses given them by inexperienced help.

In larger plants, more elaborate provisions will be necessary. Here employee cafeterias require electrically heated kitchen appliances, motorized equipment such as dishwashers and mixers. Elaborate trolley systems above cutting tables, conveyor systems, air conditioning, and other facilities for greater comfort or decreased employee effort are also found.

The relief of eye-strain, coupled with reduced rejects or flaws means that the lighting design offers many interesting opportunities—all of which directly affect the wiring layout. Special effects for sample room displays, for color discrimination in designing and matching dress goods, and at critical inspection stations, are other places where careful lighting applications assume considerable importance.

It pays, too, to keep posted on places where electrically heated units are used. New applications are being found along the production line, in stamping or labelling, and for heating various parts of newer machines without the hazard of flame in proximity to lint and fabrics. Some of these loads are portable and require extra circuit capacity for plug outlets, while others are fixed units on machines.

Signaling and communication needs will vary with the size and arrangement of the plant. Where all work is done over one large area, there will be a tendency to employ combinations of visual signals and bells. But with departments on various floors, and with areas divided by partitions, more efficient forms of inter-communication, electronic paging systems and coded calls will be found necessary. Consider, also, the introduction of a system for broadcasting music from radio programs and records.

Here then, are examples of wiring applications which find practical use in some of the varied forms of clothing and garment manufacture. Where employee convenience or comfort contributes to better morale or increased efficiency, because of electrical means, your job is to make suitable provisions in the wiring layout. Some of your present factories need these improvements too but have not been properly approached. Perhaps their old wiring is incapable of handling the additional load, or is now badly out of condition. Here are opportunities for modernization, provided the approach is based on improving the employer's working efficiency.

Use the following reminder list in planning the wiring of clothing and garment factories in your community. And as you work among plants of this type, other needs will come to mind to help sell a more complete electrical installation.

1. CUTTING TABLES *are drenched with light to provide workers in this shirt making plant with ideal seeing conditions.*

2. CLOTHING MANUFACTURE *runs to large operations incorporating grouped workers. Power and lighting requires special consideration to suit the layout.*

3. PRESSING METHODS *may vary the load, yet lighting remains an important production aid. Here gas heated irons have connections for electrical lighters.*

4. SEWING MACHINE AISLES *for making ladies undergarments in this plant call for safe and uninterrupted power to assure smooth production.*

CHECK LIST FOR CLOTHING FACTORIES

MOTOR DRIVEN EQUIPMENT

- Air Conditioning
- Air Compressors
- Baling Machines
- Bobbin Winders
- Buttonhole Presses
- Cloth Cutters
- Conveyors
- Drying-out Presses
- Elevators
- Fans, Ventilating
- Heating System
- Kitchen Motors
- Office Machines
- Patent Button Fasteners
- Pattern Cutter
- Perforators
- Pumps
- Sewing Machines
  - Plain
  - Multiple Needle
  - Buttonhole
  - Overlook
- Stamping Machines
- Trucks
- Unit Heaters
- Vacuum Cleaners
- Water Coolers

ELECTRICAL HEAT

- Cafeteria Equipment
- Irons
- Pad Form Heaters
- Portable Heat
- Sad Irons
- Stamping Machines
- Unit Heat (Machines)
- Water Heaters

SIGNALING FACILITIES

- Annunciators
- Burglar Alarms
- Bells
- Code Calls
- Employee Recorders
- Fire Alarms
- Office Buzzer System
- Sprinkler Alarms
- Telephone System
- Time Clocks
- Time Stamps
- Vault Pilots
- Watchmen Systems

ILLUMINATION

- Color Matching Units
- Display Rooms
- Exit Lights
- Inspection Lights
- Night Lights
- Office Lighting

General illumination should range from 20 to 30 footcandles, according to type of work involved. For cutting, inspecting and sewing light goods require 20 footcandles, dark goods require 100 footcandles, best provided by supplementary units.

UMI

The Electrical Committee:— WHO and WHY

By F. C. Hodkinson

Long head of the American Circular Loom Company, Frank Hodkinson was for years prominent among electrical manufacturers. He was a leader in AMES, a member of the Board of Governors and Executive Committee of NEMA, an administrator under the NRA. Now retired, he is still a close observer of electrical affairs and writes out of a broad experience and mature judgment.

An analysis of the present balance of voting power in the membership of the tribunal that formulates the National Electrical Code — Commercial interests now too strong — Readjustment needed.

THE entire electrical industry is vitally concerned with the makeup of the Electrical Committee of the National Fire Protection Association. This committee operates as a section of the American Standards Association. It sponsors and administers the National Electrical Code. And because the Code was based on sound principles and has been well established, it has been recognized by federal, state and municipal governments for over forty years.

For many years the membership of the Electrical Committee comprised active engineers and inspectors of fire underwriting organizations. These men spoke their own minds and the Code expressed the best engineering judgment of their day. The momentum of this excellent youthful vigor carried it forward.

In recent years national standardization in many lines has become more a matter of association endeavor than of independent engineering judgment. The representatives on the Electrical Committee today, with few exceptions, follow the dictation of the association by which they are nominated.

This system of control has extended to a point where the policies of one group, determined in secret or open alliance with some other group, can change the character of the legislative acts of the Electrical Committee. There is no longer a meeting of engineering minds. There is a pressure for voting strength, frequently in the interest of some commercial objective. Therefore, federal, state and city governments are now reappraising the Committee.

The present Electrical Committee consists of representatives classified in 20 different groups. But some two or three groups are so joined in commercial interest or by pressure of one group upon another, that in a controversial situation they usually act as a unit. The relation between these groups, from this directed voting standpoint, is apparent, in the accompanying listing, by their natural common interests.

Of these 51 members of the Electrical Committee, ten represent governmental or public agencies and are free to express their own engineering judgment. But ten votes alone cannot prevent a bad Code change—if pressure enough is applied in other groups so that their representatives are instructed to vote for it. In a word, the governmental agency representation is not sufficient for the defense of the Code against an attack by commercial interests.

Some other organizations, of course, affirm from time to time that their representatives on the Electrical Committee also represent the public. And it is true that each organization does represent a portion of the public. And in spite of a considerable active membership among utility employees, the IAEI group has in most cases worked in general unity with the governmental agencies. And in many instances, certain representatives of the insurance group have felt free to express the same general convictions.

But if all the IAEI members joined with the ten representatives of governmental agencies in defending the Code against commercial attacks, there would be but 17 defensive votes out of 51, one vote too few to prevent a threatened lowering of Code standards. And this is a pretty precarious defensive representation to rely upon.

They see certain commercial agencies, of large representation, strenuously opposing any increase in the present small representations of government or of organizations which cooperate, with government. They see NFPA torn between these questions of proper

(*Continued on page* 43)

Balance of Power in the Personnel of the NFPA Electrical Committee

MEMBERS	VOTING POWER
1. UTILITY AND MANUFACTURING GROUP	
Electric Light and Power Companies	7 votes
National Electrical Manufacturers Association	7 "
Telephone Companies	1 "
Association of American Railroads	1 "
Group Total	16 votes
2. INSURANCE INTERESTS GROUP	
Stock Fire Insurance Inspection Bureaus	7 votes
National Board of Fire Underwriters	2 "
Underwriters Laboratories	2 "
Associated Factory Mutual Insurance Companies	1 "
Association of Mill and Elevator Mutual Insurance Companies	1 "
Group Total	13 votes
3. GOVERNMENTAL GROUP	
United States Conference of Mayors	5 votes
International Association of Industrial Accident Boards and Commissions	1 "
International Association of Government Labor Officials	1 "
International Municipal Signal Association	1 "
City of New York	1 "
National Bureau of Standards	1 "
Group Total	10 votes
4. INSPECTION GROUP	
International Association of Electrical Inspectors, Group Total	7 votes
5. SPECIFICATION AND CUSTOMER GROUPS	
American Institute of Electrical Engineers	1 vote
American Institute of Architects	1 "
Association of Building Owners and Managers	1 "
Group Total	3 votes
6. INSTALLATION GROUP	
National Electrical Contractors Association, Group Total	2 votes
Total Membership of Electrical Committee	51 votes

UMI

CASH PICKUP—*Norton Frierson on his weekend collection tour among his Negro customers.*

WIRING Negro Houses

Easy Payments Secure the Wiring of Many Houses Otherwise Unsalable and at a Profit.

By Norton Frierson
Savannah, Georgia

FIVE sub-divisions have been wired up near Savannah recently. All of them would be using kerosene lamps if it had not been made possible for the tenants to wire their houses and pay for them by easy payments.

These houses are occupied by negroes and they have no money. But they want electric light. I decided to wire the buildings and take a chance on collecting $7.50 when the lights are burning and $5 a month until the bill is covered. We have done the work on 112 homes. It made work for men last year during a period when there was little else to do. It has also made me considerable profit. It all came about this way.

These developments were built by negroes themselves years ago on the outskirts of the city. Some of them three to twelve miles away. Some of them are 20 years old. To connect them the power company had to spend from $1500 to $2000 to run service to each project of twenty houses. But they could only get a satisfactory guarantee from two homes per project.

The reason was that there were only one or two prospective tenants that could pay cash. This would not assure the power company a return on its investment and they were not willing to take a chance.

It devolved on someone to work out a plan to get electricity into these homes. I figured it over and decided to gamble on human nature as I know it among the negro population. So I wired up the first 20 houses complete before the power company made a move.

As the power company had to secure easements for the pole line, set poles and transformers, run wires and install meters before current was turned on, it was 90 days after the wiring was done before the current was turned on. Meanwhile, I worked out a simple form of typewritten contract and proceeded to sell the negro families who had built the houses. My agreement was that they would pay nothing until the lights were turned on. I carried the bag.

All of these houses are owned by the tenants and in this case the power company does not demand a $5 deposit. This helps a lot toward getting the house wired, as the customer has no outlay for electricity until the lights are burning. A typical installation consists of 7 ceiling outlets, 2 flush switches, 2 convenience outlets and a porch light. The job is wired in armored cable concealed in the attic, with drop cords and key sockets. The price is $56.55.

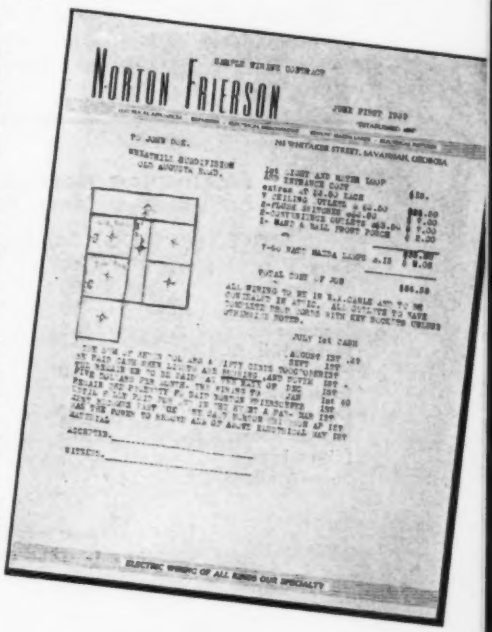
I have found that by charging $15 for the meter loop and first light and $3.50 per outlet additional, either switch or receptacle, the price gives me a profit adequate to cover the cost of collecting over a period of eight to ten months. The contract is made out in duplicate and I require the customer to keep his copy at hand so I can receipt each copy when collections are made.

Some competitors have called me a fool for doing this class of work. I will admit that it keeps me collecting day after day, particularly on Saturdays and very often Sundays also. Of course, with so many accounts there are bound to be some who fall by the wayside. But on the whole I consider the business a good risk.

On the first two subdivisions of about 50 houses, I wired the buildings without any written acceptance of any kind. I simply took the promise that they would pay promptly, together with their eagerness for electric lights. Other contractors had attempted to get the wiring of these houses but they would not give time payments and the project fell through.

On the last 75 houses, however, I have secured signatures from the owner permitting me to remove the wiring if he falls down on his payments. But to do this I would have to have this paper recorded at a cost of $1 each. So far I have not recorded them and have saved the dollar. The program has been working now for more than 15 months. A great majority of these customers have paid up in full. Meanwhile, I am getting new customers.

CONTRACT FORM—*Type of contract used by Frierson in wiring small homes on his easy payment plan.*


NORTON FRIERSON

ELECTRIC WIRING OF ALL KINDS OUR SPECIALTY

UMI

SELLING LIGHT to BEAUTY SHOPS

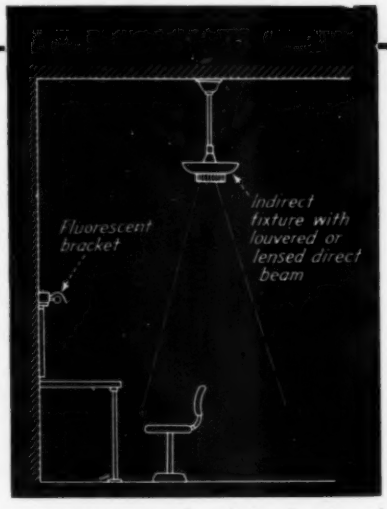
This is the seventh in a series of practical suggestions—layout, equipment and intensities—to help you sell modern lighting equipment to local commercial and industrial establishments

GOOD lighting for the beauty shop follows the same design principles as those required for lighting other types of commercial establishments. First, the lighting system must be designed to provide adequate, glareless illumination for the individual tasks performed under it. Second, the layout and appearance of the lighting unit must be attractive and in harmony with the character of the shop and its furnishings.

Because women customers are notoriously critical of the decorative features of the establishments with which they do business, attractive appearance is a vital feature of the lighting system design. This problem must be worked out against conditions existing in the individual shop. The accompanying lighting layout is trimmed to the good lighting essentials. However, there are many other ways, more or less elaborate, to apply these lighting essentials.

In this diagram, it is assumed that the shop has been converted from some other type of establishment with a common type of front window and entry. With this in mind, some form of window lighting will be required, and the layout shown follows good practice for the ordinary retail establishment in a normally well-lighted shopping area.

It is recommended that window lighting be provided from a good quality window reflector spaced 12-in. on centers and equipped with 150-watt lamps. As window trim is principally decorative and designed to attract the eye of the passerby, more than to see a particular object of merchandise, it is advisable to provide a system which is as flexible as possible. Window lighting reflectors should be provided with detachable color screen equipment and spotlights on swivel mountings provided to highlight the display centers. If the windows are visible to the customers from inside the shop, the reflectors should be properly louvered to avoid direct glare.



SKETCH SHOWING *the relative location of lighting units in the wave and set booths.*

Lighting the entryway should be handled by an appropriate unit. Flushed recessed lighting units with lens or stippled glass covers are among the most popular type for modern styled shops.

The lounge and waiting room where customers read, sew or chat with their neighbors waiting for an appointment, lends itself to a variety of lighting treatment. A good illumination standard for this area is approximately 20 ft. candles and the shop shown in the accompanying diagram provides this through full-indirect, suspended ceiling fixtures rated at 300-watts spaced on approximately 8 by 8 foot centers. In the more elaborate establishments, it may be desirable to install a system of cove lighting with added intensities provided from torchieres, and IES type floor lamps to provide a "homelike" atmosphere.

Hair cutting is usually handled in separate curtained or partitioned booths. Because the barber's seeing task is often highly critical, 30 foot candles of gen-

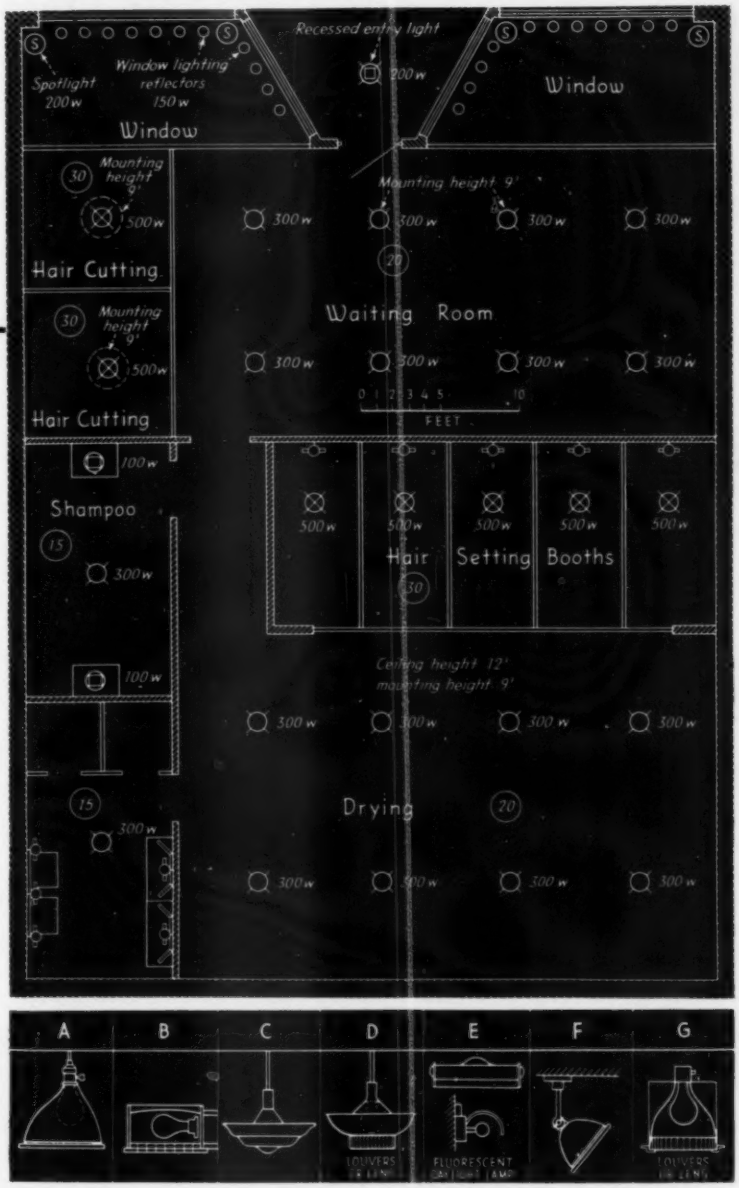
RECOMMENDED LIGHTING INTENSITIES AND TYPES OF LIGHTING UNITS FOR THE BEAUTY SHOP

SPACE	FOOT CANDLES	TYPE OF UNIT	
Entry	10	Recessed direct	B – 200 watt
Waiting Room	20	Indirect	C – 300 watt
Hair Cutting	30	Indirect-Direct	D – 500 watt
Shampoo	15	Indirect	C – 300 watt
(over bowls)		Recessed direct	G – 200 watt
Wave and Set	30	Indirect-Direct	D – 500 watt
(over mirror)		Floor Bracket	E – 20 watt
Drying-Manicure	20	Indirect	C – 300 watt
Powder Room	15	Indirect	C – 300 watt
(over mirrors)		Floor Bracket	E – 20 watt
Show-Windows	..	Reflectors	A – 100–150 watt
		Spotlights	F – 100 watt

Note—Wattage recommendations are based upon the spacings and mounting heights shown.

GOOD LIGHTING APPLIED TO A TYPICAL BEAUTY SHOP

Recommended layout showing the outlet location, lighting intensities and types of lighting equipment.



PICTORIAL INDEX *to types of units specified in the table at the left.*

eral illumination, plus some additional supplementary down lighting over the barber's chair, is recommended. A simple way of providing this kind of lighting is by means of a combination direct, indirect fixture consisting of an indirect bowl with a louvered or lensed opening, providing a controlled narrow beam of direct light over the chair.

If shampoos and scalp treatments are given in separate rooms or partitioned areas, 15 foot candles of general illumination from indirect or semi-indirect lighting units are recommended. Down lights, flushed recessed units equipped with louvers, or lens beam control mounted directly over each individual shampoo basin, provides good quality supplementary illumination. Under ordinary conditions, the general lighting is used at all times with the "down lights" turned on as the individual basins in booths are used by operators.

The most critical seeing task of the beauty shop is carried out in the waving and setting booths. Here the operators must separate the hair into strands for applying the waving equipment. The seeing task is roughly equivalent to sewing on dark cloth and, therefore, requires relatively high intensities. It is recommended that general lighting should give 30 foot candles, plus additional direct down lighting to provide intensities of approximately 50 foot candles or more in the operation area.

Lighting Units to Use

In the layout shown, each booth is equipped with a combination direct, indirect unit which includes a controlled beam down light. For applying make-up, bracket lights equipped with daylight fluorescent lamps are shown over the mirrors.

Lighting in the hair drying area should be designed for adequate intensities from sources that provide a maximum of eye comfort. The customers may spend several hours under the drying machines, reading, sewing or knitting. The recommended system shown consists of full indirect type of suspended units on 8 by 9 foot centers. Supplementary lighting needed by the manicurists in this area is usually provided by table lamps attached to the portable manicuring table, which are plugged into a receptacle located near each dryer.

In the powder room, bracket lights over the wash bowls and dressing tables should be provided to supplement the general lighting. In the accompanying layout, brackets equipped with fluorescent type daylight lamps are shown. There is now available a bracket which combines fluorescent daylight lamps with lumiline incandescent lamps, which may be switched by the user to provide the kind of light that her make-up is designed for.

If she is heading for an evening date she will apply her make-up under the lumiline lamp. If a shopping tour is planned she will apply her make-up under the fluorescent light to match the outdoor daylight.

These recommendations and the accompanying layout are based upon good lighting practice according to present standards. Each job will present its own peculiarities. But if the above methods and layouts are applied, the contractor can assure his customer of a high quality lighting installation.

UMI

1. SETTING UP MACHINE—*Operator slides the comb into an extension which is inserted into the main member of machine.*

2. WINDING A GROUP *of two "hairpin coils" for a ½ hp. motor, leaves only two connection ends.*

WINDING and SPREADING

A motor repair shop builds its own machine, lowers costs, increases its quality of coil winding, and offers more rapid and efficient service to its customers.

By William Kauppert,

Shop Superintendent
General Electrical Specialty Co.
Hollis, L. I., N. Y.

WINDING coils is one of the basic operations in the repair of motors. Labor, of course, has an important bearing on the cost of a rewind job. Also, with competition keen and modern production methods reducing new motor costs, the differential between rewind and new motor prices becomes smaller. Unless a more economical and efficient method of making coils can be found the motor repair shop faces a serious situation.

With this problem in mind, we decided to experiment and try to make more coils of higher quality in less time. We were after a method which would incorporate the following features:

1. Eliminate as many coil forms as possible.
2. Cut the time on shaping and forming operations.
3. Reduce the number of connections that must be made.
4. Obtain absolute coil uniformity.
5. Provide the greatest possible margin of flexibility.
6. Wind either single or gang coils.
7. Remove all possible mechanical strain from the windings.
8. Make coils that can be inserted in slots with a minimum of effort.
9. Wind single or gangs of coils with inexperienced labor, if necessary.

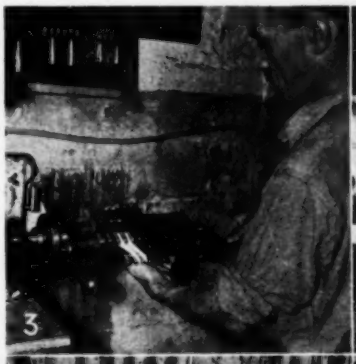
After considerable thought and experimentation, we devised a combination winding and spreading machine which adequately served our needs, and offered the following advantages:

1. Round copper coils can be wound for motors from ½ hp. to 40 hp. From experience we find this range covers 85 per cent of the windings the average motor shop has to make.
2. Only one set of "six-tooth combs" and four sets of extension brackets are needed to handle this range of windings.
3. Either a single coil or a group of 2 to 5 coils can be wound at the same time.
4. Absolute uniformity of coils can be attained.
5. It automatically forms a knuckle, or nose, on the coil ends during the spreading operation.
6. It avoids mechanical strain and allows easy installation in slots.
7. It cuts the time of winding coils. Actual time studies show that it takes 3 minutes to set up the machine for operation and 4 minutes to wind a group of 3 coils for a 5 hp. a.c. stator.
8. No other hand or machine pulling is required.
9. Coils can be wound without highly skilled labor, if necessary, since there are only three calibrated adjustments to make —A setting on the cross member of the machine, a setting on the comb extensions for the length of the hair pin coil, and a setting on the main member of the machine to obtain the pitch.

In conjunction with the coil winder, we use a card data file on which is entered the factory data of the motor. Machine settings for winding coils on the motor are also recorded. So when a motor comes in the shop, the nameplate data is recorded and the corresponding card taken from the file.

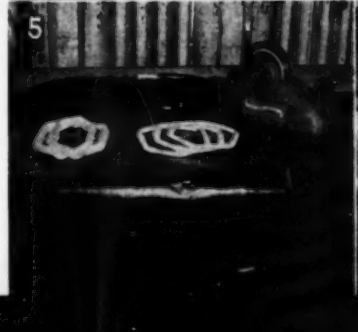
Machine settings are made from this card and the coils are wound. In case there is no data available in the file, measurements are taken from a coil cut out of the old motor and the data is then recorded. By getting the nameplate data from a customer over the telephone and consulting our card file, we very often are able to have a complete set of coils wound for the motor before it enters our shop.

Plus values in service, high quality and competitive costs today are often dependent on the use of a labor saving machine. We now have a machine which enables us to do more work, and do it faster and more efficiently with less cost to the customer.



3. SPREADING THE COILS *by turning the handle at the right, to get the diamond shape with the formed nose.*

4. REMOVING THE GROUP *of coils from the machine, after which they are tied and placed in the slots of the stator.*



5. FORMED COILS *on left, were made on the machine. Standard diamond shaped coils are shown on the right.*

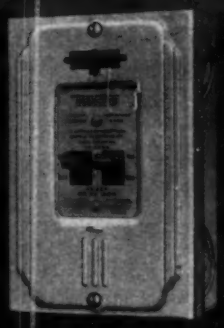
6. THIS STATOR *of a 5 hp. motor is being wound with our machine formed coils.*

THE MULTI-BREAKER LINE THAT HAS

National Acceptance

TYPE MB

anch circuit protection. Available in a ge variety of combinations from 1 to circuits varying from 15 to 50 ampere pacity per circuit.

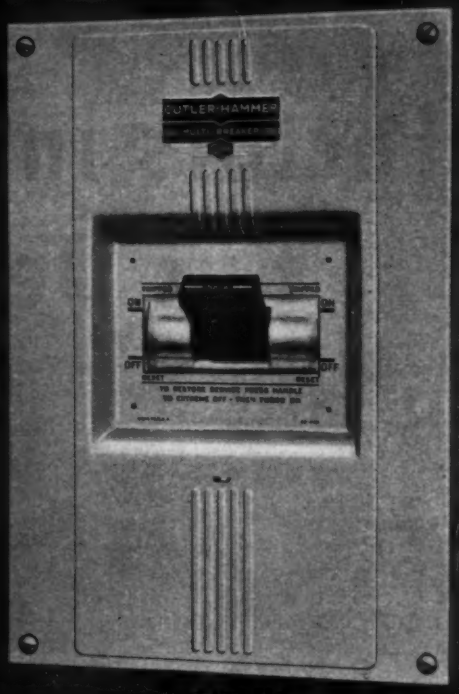


TYPE MO

For lighting and power circuits of 15, 20 or 25 ampere. Commonly used for small homes, farm outbuildings, water heater, oil burner, stoker and small appliance circuits.

TYPE M1

For lighting and power circuits of 35 or 50 ampere. Commonly used for service entrance requirements, range circuits, industrial and commercial lighting circuits.



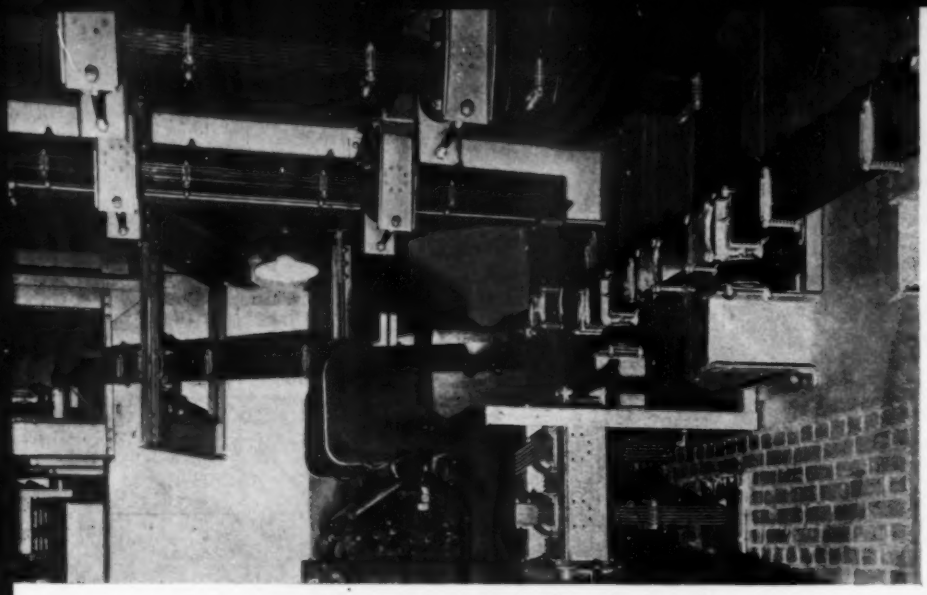
TYPE M2

For circuits of 50, 70, 90 or 100 ampere. Commonly used for large service entrance requirements, disconnect and circuit protection for all types of power requirements within its capacity.

Cutler-Hammer Multi-Breakers are built up to a standard of performance that brooks no compromise . . . are nationally advertised, *consistently* advertised . . . and they have the national acceptance so necessary to easy and profitable selling. Standardize on nationally advertised Cutler-Hammer Multi-Breakers to reap the fullest rewards for your efforts. CUTLER-HAMMER, Inc., *Pioneer Electrical Manufacturers,* 1306 St. Paul Ave., Milwaukee, Wis.

CUTLER-HAMMER
MULTI-BREAKER
C-H

UMI



DESIGN PROBLEMS *were many, in installing this heavy bus structure in a steel mill. It paid to call in a specialist. (Delta-Star Electric Co. photo).*

Factors in Bus Design

BUS structures must be designed to carry given values of current, to withstand probable short circuit stresses, and to provide properly for linear expansion. This involves many engineering details that must be worked out in applying bus bar systems to handling heavy loads in industries and larger commercial buildings and institutions. The following data presented through the cooperation of the Delta-Star Electric Company, offers some useful guidance in these three directions.

Bus Bar Capacity—

The ampere capacity for both copper and aluminum bars is normally worked out in ratings for vertical bars, on edge. These values are based on 30 deg. C. rise over 40 deg. C. ambient, for indoor service with air still but unconfined. Spacing of return conductor is 18-inch centerline. But if free circulation of surrounding air is prevented or bars are mounted close to a ceiling, the capacity will be materially reduced.

To secure higher conductor strengths, it is sometimes advantageous to mount bars horizontally or edge to edge. With bars mounted horizontally the current carrying capacity will be appreciably reduced, since the surrounding air does not circulate as freely as when bars are mounted vertically. For a single horizontal bar, the current carrying capacity will be approximately 10 per cent less than that shown on the curves. For other groupings, ratings should be reduced approximately 20 per cent for 4-inch and 30 per cent for 6-inch bars, if mounted in horizontal position.

If enclosures are used for bus structures, the ampere capacity of the bars will be materially reduced, the amount depending upon the size and design of the enclosure and ventilation facilities. Although no general ratings are given for enclosed buses, a fair approximate average is 60 per cent of the figures shown on curves for open bus structures. When bus enclosures are used, the capacity of bars mounted horizontally is only slightly lower than for vertically mounted. If bus ducts or enclosures are properly ventilated, the bus capacity can be considerably increased.

Short Circuit Stresses—

In designing bus structures, using rigid parallel conductors, proper selection of the type of conductor, supports, fittings, conductor and bus support spacing, is important to insure that the assembly will safely withstand maximum electro-magnetic forces resulting from short circuits. Stress calculation is somewhat involved if accurate results are desired.

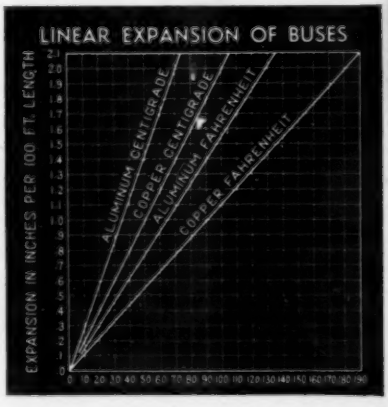
The theoretical consideration of all factors entering into short circuit stress calculations is beyond the scope of this article. But a careful check should be made to insure against disastrous results that may be suffered, if forces created by short circuit currents are not properly considered. It is best to secure recommendations from the manufacturer regarding the type, class of supports, fittings and conductors.

Linear Expansion—

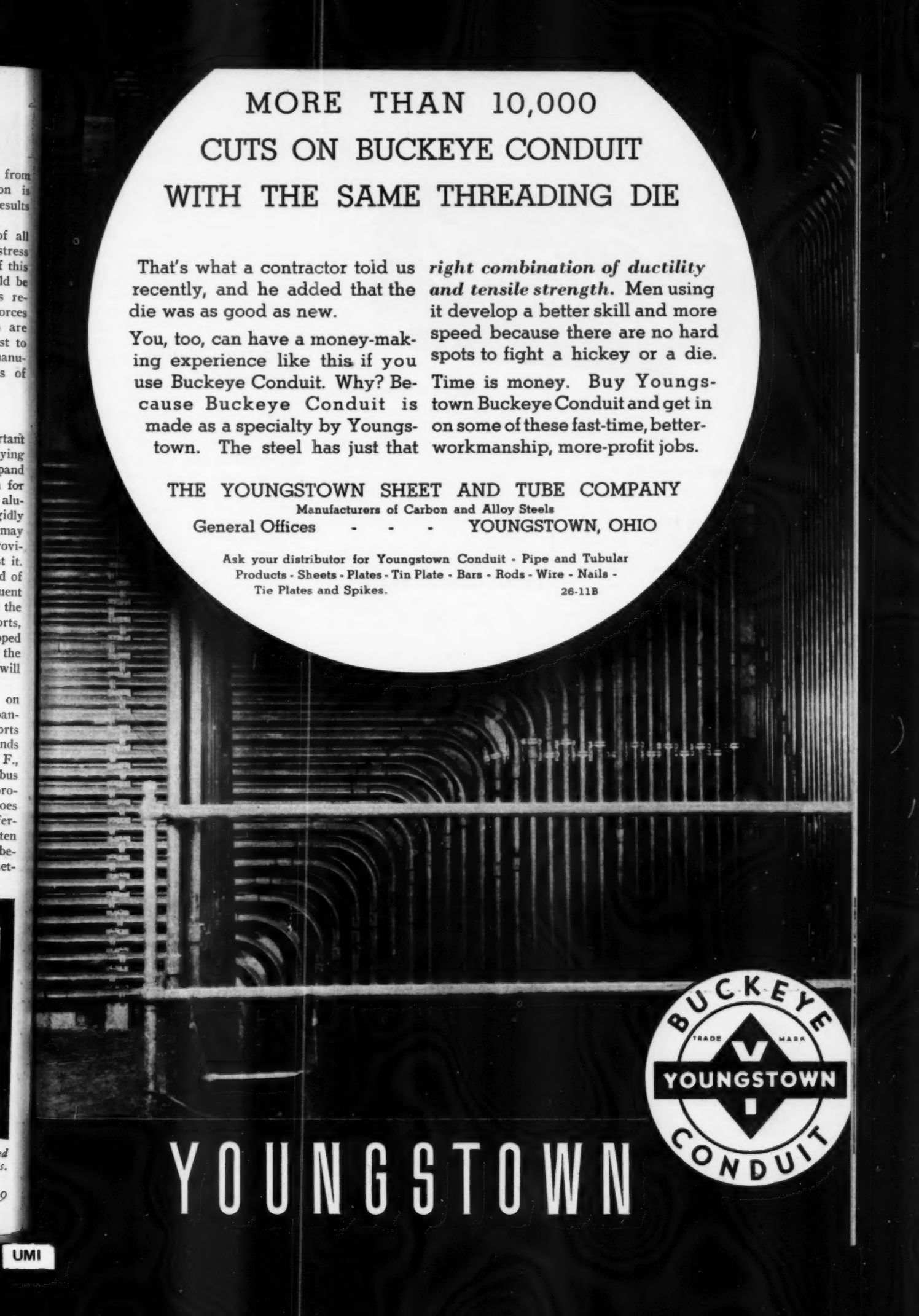
Linear bus expansion is an important factor in design. The accompanying chart shows that copper runs expand about 1.11-in. per 100-ft. of length for a 100 deg. F. temperature rise, aluminum 1.54-in. A solid run rigidly clamped in bus supports therefore may strain and break insulators, if provisions are not made to guard against it.

Expansion joints offer one method of prevention. With supports at frequent intervals, as on a high capacity run, the bus can be fixed in the end supports, split with an expansion joint, equipped with roller type bus fittings used on the intermediate supports, so the bus will "come and go" under expansion.

With bus supports mounted on concrete or brick, the wall expansion is small. But when supports are on a steel structure, it expands 0.80-in. per 100-feet per 100 deg. F., in some extent compensating for bus expansion. That is, of course, provided the supporting structure goes through as large a temperature differential as the bus. Even here, it is often desirable to use expansion joints because of sags, uneven foundation settling and misalignments.



BUS EXPANSION—*How much aluminum and copper buses expand as temperature rises.*


MORE THAN 10,000
CUTS ON BUCKEYE CONDUIT
WITH THE SAME THREADING DIE
That's what a contractor told us recently, and he added that the die was as good as new.
You, too, can have a money-making experience like this if you use Buckeye Conduit. Why? Because Buckeye Conduit is made as a specialty by Youngstown. The steel has just that *right combination of ductility and tensile strength.* Men using it develop a better skill and more speed because there are no hard spots to fight a hickey or a die.
Time is money. Buy Youngstown Buckeye Conduit and get in on some of these fast-time, better-workmanship, more-profit jobs.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
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Ask your distributor for Youngstown Conduit - Pipe and Tubular Products - Sheets - Plates - Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and Spikes.
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BUCKEYE
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YOUNGSTOWN

Earl Whitehorne, Editor

Watching the Code

All eyes are on the NFPA Electrical Committee as it comes together in Atlantic City the first week in December. And a heavy responsibility rests upon these gentlemen. They must decide whether commercial pressure is to shape the Code hereafter or whether it is to remain a measure of safety only. And, of course, they must also keep themselves free to react to progress in the art and to public need.

The power company proposals, however sincere, are impulsed by commercial considerations. But this perfectly natural pressure must be set aside. Only the question of safety should be considered by this tribunal, and the issue should be fought out now. Once the bars are pulled down, many other substitutes will soon crowd through. And there is no substitute for safety.

No Runaway

Everybody says "How's business?" Will there be a war boom, now that we can sell 'em cash and carry? Everybody wonders.

Well, think it over. This is not the World War of 1914. It is a Nazi war of 1939, with conditions all different. The Allies won't spend $2,000,000,000 a year with us this time, because now credit and delivery is denied. Also, today they themselves have far greater resources of manufacture. They have developed new colonial supplies of raw materials. Their needs are less. They learned a lesson and have prepared to take care of themselves.

They will buy many air planes—other things—but on a smaller scale. It will stimulate our markets. Business will be better. There will be more industrial modernization, more home building. But no runaway boom, thank God.

NEMA Goes Ahead

At its recent annual convention, the market development program of the National Electrical Manufacturers Association was up for review. Is the program sound? Has the accomplishment been satisfactory? These questions were before the membership. And the answer was—Yes!—in the substantial form of new appropriations to advance the work. NEMA has tackled four fields so far—adequate wiring, kitchen modernization, rural electrification and highway safety lighting. And they are spending money studying the possibilities for industrial modernization. For in these five markets alone, an added volume of $770,000,000 a year for ten years is apparent—and the total sales of all NEMA members now bulks $750,000,000. So NEMA is going ahead.

And everything they do makes more business for the electrical contractor. Hot diggidy! But the contractor should work with them—nationally and locally—and help earn this greater prosperity.

The Spot Fad

During the depression, merchants have been clinging to their dollars. One way has been to cut down on window lighting. Out of this complex has come the shadowy background, with a spot light on the model in the Scotch plaid wedding dress.

It is not good window lighting. Also, lighting equipment manufacturers have felt a drop in sales. Contractors have lost a lot of business. And why? Mostly because electrical men have fallen for this goofy fad. Good selling will still prove that good lighting is better.

And the Chiseller Confessed

A consulting engineer came to inspect a completed job. He suspected that 12's had been used, where No. 10 circuits were indicated. So when the electrical contractor picked them up at the hotel, the engineer loudly warned the local supervisor to be careful in setting down several instrument cases.

As they drove along, the supervisor told the contractor that this big-town engineer was daffy about instruments. One was an expensive foreign device, he said—very sensitive and delicate. The damned thing showed exactly what size wire was used. Had the contractor ever seen such a gadget?

"No," replied the contractor. Then after several blocks of silence, he added—"I'm going to confess something. I want you to know before you begin to check that job that there isn't any No. 10 in branch circuits. I put in 12's because I figured close."

And by the way, this engineer's instruments actually comprised—one portable voltmeter, one split core ammeter and one sightmeter. But they are useful tools.

Your Buying

Be careful with your buying, right now. In September, when the war excitement struck us, orders for a certain well known raceway product began to pile up. People thought steel would soon be hard to get. But the manufacturer merely announced that prices would not be advanced until compelled by actual increases in cost of steel. Immediately the excess demand subsided and business continued as usual.

Now makers of rigid conduit and metallic tubing and many other steel products are behind on delivery. Lend 'em a hand. Order what you need but not because you fear a pinch. Fear is a poor basis for judgment in buying or anything else.

UMI

Does Maintenance Pay?

A new chief electrician of a research plant tried to set up a maintenance schedule. But when a practical man, bucks a lot of research minds, it is tough going. They did not like systematic housekeeping.

One day, however, he made an unofficial check-up and discovered a steam leak that was costing the company about 50 cents for every hour of operation. He also uncovered an over-designed transformer system. Six transformers were doing work requiring but three. It was wasting approximately $750 annually. Now the research men are beginning to see something to it.

The age-old argument is that it costs too much to set up an efficient maintenance shop and crew. But where this is true—someone else can do it. The electrical contractor has the equipment and organization to make quick and efficient periodic check-ups of such electrical systems. His fee will be nominal and the saving may even be phenomenal.

Why Argue It?

Clause 2110 in the Code has caused a lot of trouble. Too many electrical men have believed that its purpose is to force people to install more baseboard receptacles. And that being selfish is hard to explain to the customer.

But it's not so! The reason that rule is in the Code is because long cords that are walked on and kinked up become dangerous and cause fires. Make it plain and get more receptacles installed.

That Two Per Cent Limit

One of the principal barriers to more adequate and better new home wiring is an obsolete mental hazard that builders and architects still cling to. Back in the old days when houses were big and wiring didn't amount to much, some builders set up a rule of thumb estimate on electrical wiring not to exceed two per cent of the total cost of the building. Some architects dealing with the carriage trade set this up to three per cent.

Years rolled around and houses got smaller. Wiring systems and fixtures became more complicated. But builders still kept electric contracts within that limit.

When public demand increased the wiring system, we gave them cheaper wiring methods and materials. Further increase in wiring systems was absorbed by shaving out the contractor's profit until it got to the point where established competent concerns quit the house wiring field entirely.

Public demand for better wiring, built-in fixtures and the like is still growing. It is high time that architects in the building industry recognize the fact that electrical wiring is no longer the insignificant part of the building job that it was in 1923. They should allocate a reasonable percentage of the building fund to electrical work.

Phone Raceways

The A. T. & T. raceway campaign is going ahead. In the Pittsburgh district, for example, 90 percent of the better homes now have conduits installed for their telephone wires. It is plus business for the electrical contractor.

More than that, the telephone man who promotes raceways there advises the householder to look into "adequate wiring". The Pittsburgh League has seen to that. Smart work! And what have you done about it in your town?

A Tribute

Hats off to J. F. Lincoln and his recently published "statement of price policy." We are entering a crisis, he says. Inflation may follow. He pledges his company to maintain present prices or, if his costs go up, to add no more than the bare increase. By this he hopes to avoid the whirl winds of reaction and deflation.

If more men would speak out plainly in these matters, there would be more sustaining confidence.

Back Talk

Another College

To the Editor—"I read the article 'Young Blood for Contracting' in your October issue with great interest. However, the author makes the statement that Purdue is the first to offer a course of this kind.

"We have here at Kansas State College a two-hour course called 'Electrical Machinery & Construction' which all students entering as freshman electricals must take. This course started as far back as 1918.

"We study Code as it covers wiring methods, then by working in groups of three the students put up actual installations using knob and tube, concealed conduit, exposed conduit and non-metallic sheathed cable wiring. Each group is also given a plan of a house to layout the location of outlets, circuit arrangements and wiring specifications.

"The course is not intended to train men for the contracting field but to give electrical students a chance to know there is a Code and some of its requirements; to let each man learn something of soldering, splicing and installation of wires; and that contracting is a business that needs men with training."

O. D. Hunt, Associate Professor, Kansas State College, Manhattan.

Glad to hear that you have made a start towards giving your engineering students a little background on electrical construction, Mr. Hunt. Our interest in the Purdue course was primarily because it was definitely aimed to prepare students for the contracting business. So since your course does not have that objective our omission of your name was not too serious.

At the present time, there is probably small demand for this course and this, I suppose, is the fault of the contracting business. It has not made the career as popular as some others. We believe, however, that a practical course of this kind is worth considering.

New Lamp Bases

To the Editor—"I was highly pleased with your editorial entitled 'Hide Those Tubes,' which appeared in your October issue. Allow me to congratulate you on this very fine effort toward the correction of a very serious situation in the electrical industry.

"This use of fluorescent tubes without reflectors will have a detrimental reaction upon the electrical industry. I only hope that other editors will realize their responsibility and join your crusade against bare lamps."

D. B. Mackie, Merchandising Mgr. Curtis Lighting, Inc., Chicago.

It took a long while for electrical men to learn that the eye should be safeguarded from glare. It is bad for us now to ignore that fact, just because the new tubes have less glare. For here is a chance to make our light still easier on the eyes. We are glad you agree, Mr. Mackie.

Portable Tool Hazard

To the Editor—"We have had fatal accidents from portable lamps and tools. The use of portable saws by builders will develop into a hazardous situation unless something is done to supervise their use either through a rigid inspection service or in the design of the equipment.

"Motor manufacturers do not think the low voltage motor used with a transformer with ungrounded secondary is the solution to the problem for the sole reason that low voltage motors cost more than standard 115 volt equipment. I do not agree. But if accidents pile up, which is certain to happen, public opinion will demand a remedy and will get it.

"I have seen such tools used with bell wire, telephone wire, bare connections and almost anything except safe construction. Fuses to such tool circuits are usually too heavy or are bridged. I do not think that dependence can be placed in grounding the frame of the equipment. The portable supply conductors are usually poorly installed.

"Such being the case, how can we expect a well installed grounding connection? Ask some of your electrical contractors. They will be able to give you constructive criticism."

George Welman, Chief Electrical Inspector Louisiana Rating & Fire Prevention Bureau

You are doing a good job, Mr. Welman, in agitating this matter. If portable equipment is killing people something must be done. But what? Experience and suggestions from contractors would be interesting and helpful. Let's have some!

UMI

WIRING Methods

OUTLET BOX SUPPORT

A rigid yet simple support, for flush outlet boxes mounted in plastered columns, is made by fastening a piece of band iron around the steel column. The iron is clamped around the rear of the column flanges in "J" bolt fashion.

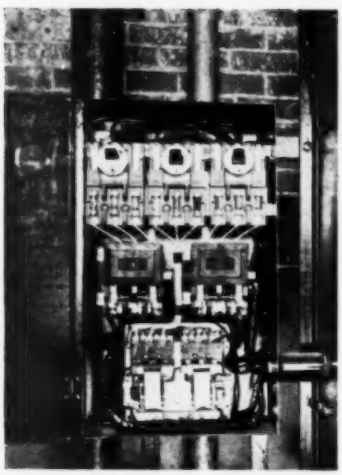
A ¼-inch bolt with a ½-inch conduit spacer holds the outlet box to the band iron and prevents it from turning when the column lath and plaster are applied. This method is used by the Garden Electric Company of Elizabeth, N. J.

***BAND IRON** and conduit nipples are used to make rigid supports for flush outlet boxes.*

COMPACT CONTROL CABINET

Compact control was the keynote in a press installation at the San Diego Sun Press, by the California Electric Works Ltd., electrical contractors of San Diego. Instead of employing the usual system of individual disconnect and magnetic switches nippled together, this contractor designed one cabinet to enclose them all.

Three Trumbull front operated XO disconnect switches are mounted above three magnetic switches, one of which is a reversing type. The disconnect switch levers project through openings in the cover when it is closed. In addition to making a neat job, the cabinet provides plenty of gutter space for the wires.



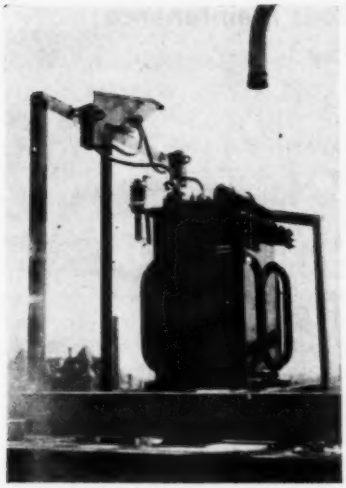
***COMPACT AND EFFICIENT** arrangement of disconnect and magnetic control switches in a single cabinet. Ample gutter space is provided for the wires.*

TRANSFORMER CONNECTIONS

Floodlighting towers at Comiskey Field in Chicago are served by a pair of 75 kva. single phase transformers mounted in the open at the base of the tower. The installation was made by Henry Newgard & Co., Chicago electrical contractor.

A 2200-volt feeder tap led from a pull box below to a heavy gage weather head mounted on an angle iron frame 18 inches above the transformer. From the weather-head the high tension wiring extends to primary cutouts mounted on the supporting frame and from there to the primary transformer terminal.

The secondary circuit of 3,500,000 c.m. conductors drop from a conduit offset to a point directly above the secondary terminals. Each tower is served by two transformers, one at each side of the platform base.



FLOODLIGHTING TRANSFORMER *mounted at the base of ball park lighting towers.*

WIRE STRINGING

The customary truck rigging for paying out wires on REA line construction jobs is usually satisfactory where lines are paralleled by surfaced roads. But, where lines penetrate forests and cross open fields, truck equipment bogs down in ruts, soft earth and mud.

***ROUGH COUNTRY** won't stop this husky wire stringing rig used on REA line construction.*

The Monroe Electric Co. of Chicago have handled a number of these jobs in wild country. They use a tractor rigging that will carry on under the severest condition.

A Caterpillar tractor with broad treads is equipped with a pair of heavy spindles which hold the reels out beyond the tread. At the rear of the tractor is a 6 x 6 beam drilled to guide the trailing wires away from the treads.

New ARROW

3-Wire, 50 Amp., 250 V.

RANGE OUTLET

with 20 Ampere

TAP-OFF

Polarized Outlet

2-wire; 20 Amps., 250 V.

This new development *doubles the usefulness* of the Range Outlet. A polarized *TAP-OFF* Outlet provides for plugging in any appliance of 20 Ampere, 250 Volt rating, — particularly for operating an automatic electric

HOT WATER HEATER

Note handy location of the Tap-Off Outlet, (as illustrated) at *top* of the Range Outlet. A 2-wire polarized plug makes the proper connection.

The new Range Outlets are of cream-tinted white IVORYLITE or black BAKELITE, embellished in modern lines attractively in harmony with the new kitchens. And embodying all features for fast, easy wiring, including the popular one-screw contacts. Knockouts provided, both bottom and back, for 1" and 1¼" conduit. Rating: 50 Amperes, 250 Volts.

Catalog Numbers:

7883 is the black BAKELITE Surface Range Outlet with Tap-Off.

7883-I is the white IVORYLITE job, as above.

Standard package, 10. Carton, 2.

ADEQUATE WIRING SERVES AND SAVES

SOLD THROUGH YOUR **ARROW ELECTRIC DIVISION** ELECTRICAL WHOLESALER

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

UMI

Better Lighting

LIGHTING A DRILL HALL

Lighting of the Armory of the 135th Infantry, Missouri National Guard in St. Louis was accomplished by an unusual arrangement of trough lighting. It was laid in two rows close to the roof ridge, with supplementary lighting over the spectator galleries.

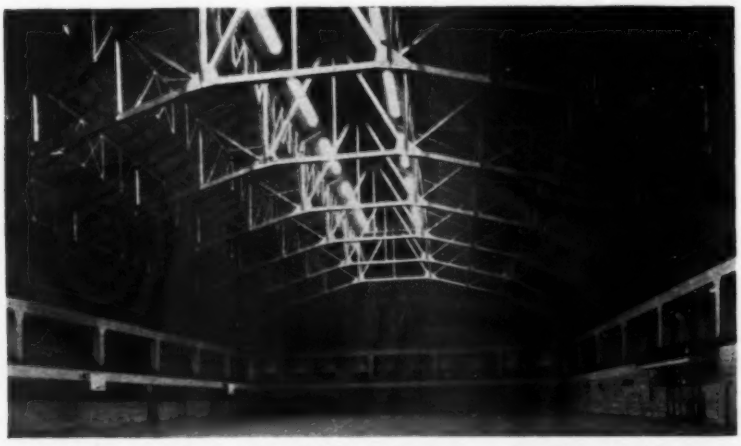
The problem involved in lighting this drill hall was to provide evenly distributed, glare-free and shadowless illumination with equipment engineered and installed so as to be easily accessible for servicing. The floor area to be lighted was 260 feet long by 140 feet wide and the lighting equipment was mounted 72 feet above the floor.

As a catwalk was included in the building plans to give access to the windows along the sides of the monitor, the lighting equipment was designed so that the same catwalk could be used for servicing the fixtures. It also simplified the installation of fixtures and appreciably reduced wiring costs.

Two rows of trough, 14 sections in all, are mounted along the center of the ceiling. A total of 134—24-in. Holophane Controlens were used. Behind each Controlens is a 750-watt lamp and a spun Alzak reflector, correctly designed and focused to distribute the light evenly over the entire floor area. In some cases the light beam was offset so as to eliminate any possibility of shadows being cast by the ceiling girders.

Readings taken on the floor six months after the installation was completed showed an average of 25 foot candles throughout.

In the balcony section readings taken on the seats show average intensities of 10 foot candles. This area is lighted by two-light exposed boxes equipped with two 8½-in. Holophane Controlens and 200-watt lamps each.



***ARMORY LIGHTING** with Day-Brite equipment uses Controlens providing even distribution over the entire floor area from two rows of lights near center of the ceiling serviced from a catwalk*

FLUORESCENTS FOR ART GALLERIES—*This fluorescent lamp installation in the galleries of the Art of Tomorrow, at 24 E. 54th Street, New York City, was installed by H. B. Sommers of Brooklyn. It uses 124 20-watt daylight fluorescent lamps, in a continuous trough. The area, is 80' x 40' with a 22' ceiling and has a white ceiling with grey sidewalls. About 35 foot-candles are on the paintings. Entire installation uses 644 fluorescent lamps.*

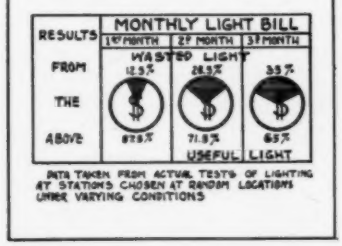
GAS STATION LIGHT LOSSES

We are trying to impress upon the service station operator the importance of washing his lighting equipment once a week. After we present our story to the operator we paste one of our slogans on the switchbox or in some conspicuous place to serve as a constant reminder to "KEEP FLOODLIGHTS BRIGHT FOR PROFIT AT NIGHT". We furnish these posters to power companies also and so far have printed 200,000 of them.

A gas service station needs good lighting at the pump island and the drive-in area. But this lighting at most stations is poor because the good equipment is dirty. We have surveyed enough stations to develop some dependable figures on what the loss of useful light amounts to. As the accompanying charts show, the cost of dirty floodlights is impressive, both in wasted light and wasted advertising values. *(From Van H. Marker, President, Revere Electric Co., Chicago.)*

"LOSS OF LIGHT"
THROUGH LACK OF CLEANING REFLECTORS

LOCATION	PER CENT LOSS IN LIGHT *		
	AT 30 DAYS	AT 60 DAYS	AT 90 DAYS
STA. A	23	30	35
STA. B	25	34	40
STA. C	22	28	32
STA. D	30	36	45
AVERAGE	25	32	38



DATA TAKEN FROM ACTUAL TESTS OF LIGHTING AT STATIONS CHOSEN AT RANDOM LOCATIONS UNDER VARYING CONDITIONS

UMI

A VARIETY OF APPLICATIONS

with

Day-Brite

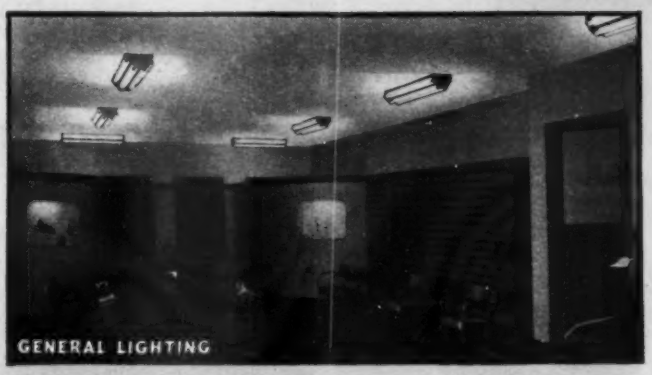
Fluorescent Lamp Fixtures

•

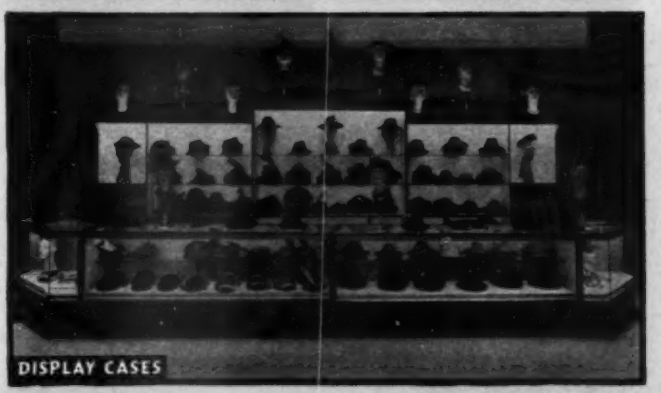
Proving the adaptability and acceptance of Day-Brite equipment for all applications where superior efficiency, style and quality are required.

WALLCASES

SHOW WINDOWS



GENERAL LIGHTING



DISPLAY CASES

Here are a few of the many successful installations using Day-Brite Fluorescent Lighting Equipment.

A full line of standard fixtures is manufactured by Day-Brite to fit practically every requirement. In addition to these standard items, Day-Brite is set up to recommend, design and manufacture specially engineered equipment for specific applications.

Let Us Hear From You

Our engineering staff is at your disposal. Let us help you solve your lighting problems. Write us today, giving complete information on the proposed installation ... the area to be lighted ... the ceiling height ... the number and location of present electrical outlets ... and the results desired. We will submit, without obligation, our complete recommendation based on our extensive experience in the field of Fluorescent lighting.

Day-Brite Lighting, Inc.

5421 Bulwer Ave. St. Louis, Missouri

UMI

Motor Shops

MOTOR RACKING

Shelving for motors and heavy equipment in the motor service shop is complicated by the mechanical job of getting material on and off the shelves. Straight shelving often makes it difficult to hook on the hoists without moving the equipment so far off the shelf that the motor is likely to tip over.

At the Excel Electric Motor Service Company in Chicago, the steel shelving framework slants from a narrow shelf at the top to a wide shelf at the bottom.

SLANTED SHELF *structure permits safe handling of heavy equipment.*

Each shelf thus projects a few inches on either side beyond the shelf immediately above.

Motors or other heavy equipment can be slid out to the edge of the shelf and the chain hoist attached without danger of tipping off the shelf or interference from the shelf above.

A mono-rail chain hoist runs completely around both sides of the shelf for convenient loading and unloading.

COIL WINDING

For continuous production on stator windings for small motors the Tennessee Electric Motors Service Company, of Nashville, Tennessee, places everything needed within easy reach of the winding machine operator.

WINDING PRODUCTION *accelerated by compact arrangement of machine and wire reels.*

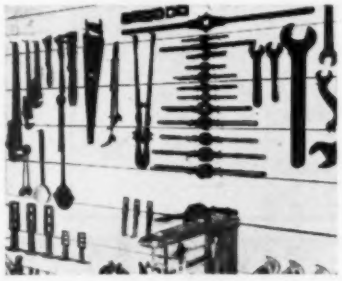
Three narrow shelves back of the coil winder carry interchangeable winding heads for the machine. Other shelves carry the smaller magnet wire reels.

A quick changing reel holder behind the operator allows a new setup to be made in a few seconds.

TOOL RACK

A place for everything and everything in its place is the ideal that every well run motor shop tries to adopt. Tool racks with a hook for each tool are satisfactory if everyone using the tools knows where they belong on the rack.

At the Swanson-Nunn Electric Co. shop in Evansville, Ind., the problem is neatly solved by painting in a black silhouette of each tool in its place on the white tool rack. If the tool matches the shadow that is where it belongs and a glance tells what tools are out.



SHADOW RACK *keeps tools on the right hooks and shows what tools are missing.*

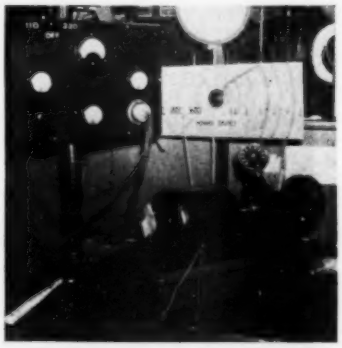
SMALL MOTOR TEST SET

A unique set for testing fractional horsepower motors is being used by the Electric Motor and Repair Company of Trenton. The set consists of a meter board, brake system and tachometer. The meter board contains a wattmeter, two ammeters of different ranges and a voltmeter. It is supplied with either 220 or 110 volt single phase current.

The brake consists of a pivoted beam and rope system with speed and horsepower settings together with a pointer scale with the dial divided into percent of full load graduations. The dial type tachometer shows the speed in revolutions per minute. The complete set is mounted on a small table taking up very little space.

The motor to be tested is placed on the little platform on the bench and its shaft is coupled to the tachometer. The motor is run and meter readings taken.

A short circuit in the motor will show a high ampere reading. The brushes can then be removed and the armature tested. This test works similar to the "growler test". A high wattmeter reading would indicate a shorted armature.



MOTOR TEST *set for fractional horsepower motors. Facilitates quick, accurate analyzation and location of motor troubles.*

A table of motor test data is conveniently posted near the machine. This table includes values in watts for no load, test, and full load. Percent torque values are listed for start, pull-in, and maximum. Values for "cut-in" r.p.m. are also listed. These values cover a range of motors from 1/6 to 1 h.p.

By using this testing equipment small motor troubles can be located and analyzed while the customer waits.

UMI

Is this feature ON THE TIME-SWITCH YOU NOW BUY ?..

Convenient and safe tripping by hand at any time, to either "on" or "off" position, without interferring with subsequent automatically operated trippings.

UNLESS a time-switch possesses certain features of operation, it is not worth the money, no matter what the price. Ease and safety of manual operation are as important as dependability and accuracy. Any Sangamo time-switch qualifies unreservedly in these respects—often presenting more than double the value for but little more than the lowest-priced time-switch. It will pay you proportionately bigger profits, too, to buy this better time-switch.

New Catalog No. 300 describing the complete line of Sangamo time switches now available. Write for a copy today.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

The LEVITON KWIKCHANGE

LINE OF WIRING DEVICES HAS EVERYTHING

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UMI

Maintenance

MAINTAINING THE SYSTEM LIFE-LINES

WIRES and Cables are the life-lines of plant electrical systems. They are the media through which electrical energy moves from purring generators to throbbing machinery. A cable fault often means a serious shutdown.

Proper selection and application of the various types of wires and cables is, in a broad sense, the first step in maintaining continuity of electrical service. Electrical men, in expanding plants, must be ever conscious of over-loaded feeders, excess voltage drop, future expansion, unusual moisture conditions, explosive and corrosive atmospheres and the condition of the cable insulation. Systematic tests must be made to determine the suitability of cables for existing conditions.

To know what to do, where and how, the maintenance man must be familiar with the use of the latest testing equipment and the newest types of wires and cables which will solve his problems.

To aid the electrical man in his selection, the Maintenance Guide Sheets this month cover a general review of the wires and cables most commonly used. Previous articles covered:

1. Alternating Current Motors
2. Direct Current Motors
3. Alternating Current Motors—Maintenance
4. Direct Current Motors—Maintenance
5. A.C. Motor Starters and Controllers
6. D.C. Motor Starters and Controllers
7. Maintenance of Control Equipment
8. Special Control Problems
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices
19. Circuit Breakers
20. Equipment for Hazardous Locations
21. Transformers
22. Wiring Devices and Fittings
23. Wire and Cable (this issue)

Coming articles will discuss

24. Belts and Pulleys
25. Couplings, Gears and Chains
26. Elevators, and Industrial Trucks
27. Conveyors, Cranes and Hoists
28. Ventilating and Air Conditioning Equipment
29. Management of Maintenance

WIRE AND CABLE

Selection, Application and Maintenance

DURING the past ten years many changes and developments have been made in wire and cable. The result is a greatly improved line of conductors designed to fit every need for electrical circuits.

All the wire and cable products, which might be required in industrial plants, commercial buildings and institutions cannot be covered here. Only the essential products used by the electrical maintenance man will be treated in this discussion. And a review of the important points for selecting, applying and maintaining wires and cables should be valuable.

For obvious reasons, conductors are insulated. Bare wire and cable are seldom used on plant premises. The most common types of insulation used for wires and cables are paper, cotton, asbestos, varnished cambric and vulcanized rubber. From the standpoint of the number of applications, vulcanized rubber is more broadly used than any of the other materials.

Construction specifications for insulated conductors commonly employed are given in NEC, Chapter 10. The listed classifications and types (in parenthesis) are—Rubber-Covered Conductors (R, RD, RM, etc.), Varnished-Cambric-Covered Wire (VC), Asbestos-Covered Wire (A), Slow-Burning Wire (SB), Weatherproof Wire (WP), Slow-Burning Weatherproof Wire (SBW), Armored Cable (AC and ACL), and Non-Metallic Sheathed Cable.

Calculation of proper conductor size for different types of load is a common problem that the electrical maintenance man encounters in his work. An illustrated method to meet the 1937 code requirements is given in the accompanying Maintenance Guide Chart.

Allowable continuous current-carrying capacities of copper wires and cables are given in NEC, Chapter 9, Table 1. The capacity of aluminum conductors is 84 per cent of the capacity of the same sizes of copper conductors with the same kind of insulation.

New recommendations on current ratings for rubber insulated conductors have been made by NEMA. If the recommendations are included in the 1940 Code, it will be exceedingly important that the electrical maintenance

***FOR LIGHTING SERVICE** on West Side Highway, New York City, cable is pulled in conduit, at an angle to prevent abrasion of insulation.*

UMI

ARMORED CABLES, two runs with three conductors in each, are used as power feeders, laid in a trench at this iron works.

man clearly understands the temperature limitations of the various grades of insulation.

Selection and Application

Before attempting to select the type of cable or insulation, it is very essential that a careful analysis be made to determine just what operating conditions are to be encountered. Because of the multiplicity of conditions which may be encountered, only the principal ones are listed here:

1. What distribution voltages are readily available on the premises?
2. What power loads or lighting loads are to be carried?
3. Are the loads continuous or of short duration?
4. What are voltage drop limitations?
5. Will wiring be run open, concealed, buried or submerged?
6. What are limitations of space clearances?
7. What ambient temperatures will be encountered?
8. Will wiring be subjected to excessive moisture, acids, oil, other chemical exposures, and electrolysis?
9. Will wiring be subjected to mechanical exposures such as abrasion, impact, tension and vibration?
10. What are the requirements of National Electrical Code or other regulations which will influence the design?

After giving full consideration to all factors, a suitable type of insulation may be selected by reference to the table, "Types of Cable and Insulation for Conduit and Duct Use," on this page.

Operating conditions are the principal factors in selecting portable cords or cables. The more common cords used in the average industrial plant and commercial building are listed in the table, "Portable Cords or Cables," on a succeeding page.

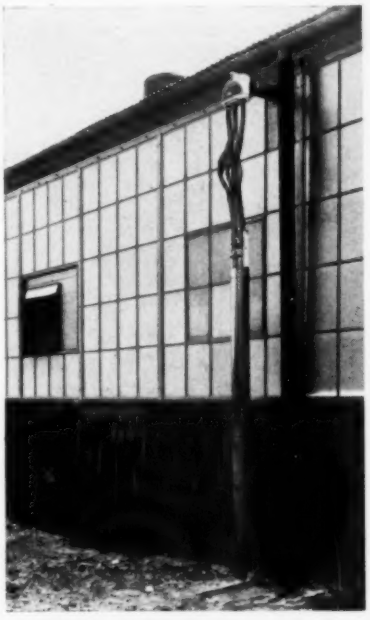
Special forms of cable which cannot be readily classified as to type are available. These products and their general characteristics are:

1. *Control Cables*—Control cables are generally insulated with a vulcanized rubber compound. The standard compound is usually 30 per cent grade, but other grades are obtainable. When cable is to be used in dry locations, the outer covering is usually a flame-resistant treated braid. If cable is to be subjected to water or excessive moisture, an outer covering of lead sheath or a vulcanized rubber jacket is recommended.

2. *Armored Cable* or *Non-Metallic Sheathed Cable*—This type of cable is quite commonly used for surface wiring of branch lighting or small motor circuits of 110-220 volts.

3. *Metallic* or *Non-Metallic Armored Parkway Cable*—Where cable circuits are to be run underground between buildings or buried under floors, either Steel-Taped Parkway or Non-Metallic Armored Cable is recommended.

4. *Welding Service Cable*—For welding service, an extremely flexible rubber-jacketed cable is almost universally used.



TWO RUBBER-JACKETED three-conductor cables run in parallel in ground from transformers to building service.

5. *Signaling-Circuit Cable*—Service of signaling circuits varies so greatly that problems should be referred to a wire and cable manufacturer.

In addition to the foregoing products, many other types of insulated wire and cable are available for specific conditions. For the particular applications and types to be used, reference should be made to a reputable manufacturer.

Two of the most important factors in the use of wire and cable are current-carrying capacity and length of run. Energy loss, power factor and voltage drop have a bearing on the size of the conductors. Therefore, too much emphasis cannot be made on selecting and

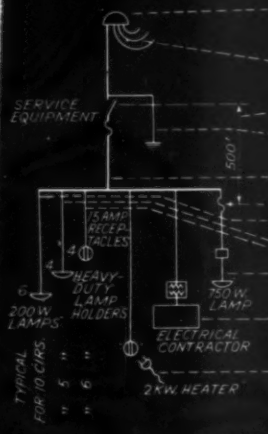
Types of Cable and Insulation for Conduit and Duct Use

Type Letter	Insulation	Voltage Limits	Temperature Limits	Application
R	Rubber—Code Grade	0-3000	50° C	For ordinary service in dry or slightly damp locations
RP	Rubber—30% Grade	0-8000	60° C	For ordinary service
RH	Rubber—Heat Resistant	0-8000	75° C	For warm locations
RW	Rubber—Moisture Resistant	0-8000	60° C	For wet locations
RL	Rubber—Lead Sheath	0-3000	50° C	For wet locations
RPL	30% Rubber—Lead Sheath	0-8000	60° C	For wet locations
RHL	Heat Resistan:—Lead Sheath	0-8000	75° C	For hot, wet locations
SB	Cotton	0-600	90° C	For hot, dry locations
VC	Varnished Cambric	0-7500	85° C	For high-voltage, dry locations
VCL	Varnished Cambric — Lead Sheath	0-7500	85° C	For high-voltage, wet locations
....	Paper and Lead	0-33000	85° C	For extremely high-voltage either dry or wet locations
A	Asbestos	0-600	200° C	For extremely hot, dry locations
AVC	Asbestos Varnish Cambric	0-7500	105° C	For high-voltage, hot locations, or oil or acid

NATIONAL ELECTRICAL CODE (1937) REFERENCE CHART FOR WIRES AND CABLES

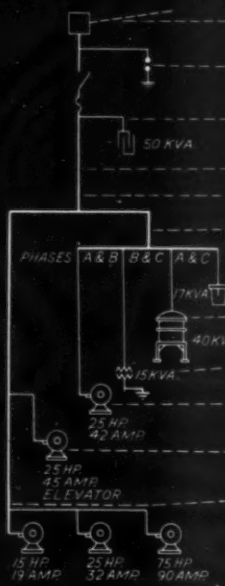
By JOHN M. TURNBULL, *Electrical Engineer, Springfield, Mass.*

An Example for Power Service in an Industrial Plant



ELEMENTS OF DISTRIBUTION SYSTEM 115/230 VOLT, 1-PHASE, 3-WIRE SERVICE	CONDUCTOR SIZE	CODE SECTION OR TABLE	CONDUCTOR TYPE AND REMARKS	CODE REFERENCE SECTION
Lighting Service, Overhead	No. 2/0 minimum 300,000 cm recommended	2305	Rubber-covered, 30% grade recommended for long life	2304d
Uninsulated Neutral		2203	Bare	2304a
Voltage Drop	5.1 volts, 2.2% 3% maximum	2201	Based on 300,000 C.M.A.C. resistance 0.0378 ohm per 1000 feet.	
System Ground Wire	No. 8 for 2/0 No. 4 for 300,000 cm.	2596b	Same as conductor to which attached	2591b
Lighting Feeder	300,000 cm.	2202a		
Branch Circuit Fuse			Rubber, if temperature not over 120 deg. F. If over, use V-C up to 167 deg. F. Slow-burning up to 194 deg. F. or asbestos covered. Based on maximum of 3% voltage drop.	3004a 3004b 3004c 3004d
Branch Circuits a	No. 14 Better to use No. 12	2107b		
Branch Circuits b	No. 12 for all			
Branch Circuits c	No. 14 branch circuits			
Fixture Wiring	No. 14 CF	Table I	Type RF for low temp., CF for dry places, AF for high temp., etc.	4137a
Sign Wiring, over 600 volts	No. 14 minimum	6031b	Neon Sign or Ignition cable Type GTO	6031b
Flexible Cords	No. 12	4005 4007	Type POSJ for radios, C for pendants, S where subject to hard usage, dampness, etc.	Table 19

460-VOLT, 3-PHASE, 3-WIRE SERVICE

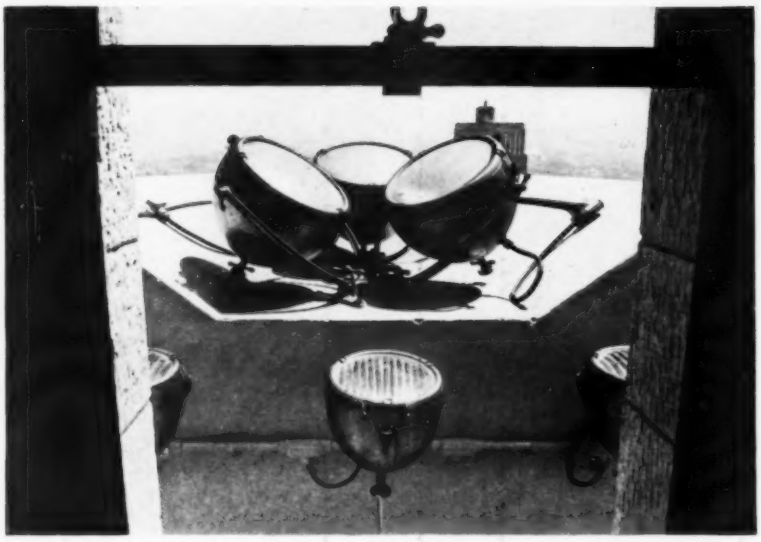


	CONDUCTOR SIZE	CODE SECTION OR TABLE	CONDUCTOR TYPE AND REMARKS	CODE REFERENCE SECTION
Power Service, Underground	Two 4/0 in parallel	2305	Lead-covered RL, or other type specially approved, like RW	2304b
Lightning Arrester	No. 6 minimum	2807	Copper, or equivalent	2807
Capacitor	No. 4 R.	4607		
Power Mains	Two 4/0 R. in parallel	4315	Conductors may be placed in multiple only by special permission but generally it is not economical to use sizes larger than about 300,000 cm. Better to use 2 or more wires of equal area.	3004
Cables in Multiple		Table I		3007
Power & Light Feeder	No. 4/0 R.	4315		
Welder	No. 6 R.	Table I		
Resistance Furnace	No. 4A	Table I	Asbestos cable, Type A used to withstand maximum temperature	4705
Lighting Feeder*	No. 8 R.	Table I	Rubber-covered, Type R, used for ordinary conditions	3004
Motor Branch Circuit Continuous Duty	No. 4 R.	4312		
Motor Branch Circuit Intermittent Duty	No. 6 R.	4312		
Motor Feeder	No. 3/0 V-C.	4314	Varnished cambric may well be used for conductors about 500,000 cm and larger, for increased flexibility and temperature rating. Use lead sheath in damp locations.	3004b

CALCULATIONS FOR CONDUCTOR SIZE

ELEMENTS OF DISTRIBUTION SYSTEM 460-VOLT, 3-PHASE, 3-WIRE SERVICE			REMARKS	CODE REFERENCE
Motor Feeder	Minimum Capacity	125% of 90 + (19 + 32 + 45) = 209 amp.	Use No. 3/0 V.C. of capacity = 210 amp.	4314 Table I
Motor Branch Circuits	Minimum Capacity Intermittent Duty, 30-min. Rating	90% of 45 = 40.5 amp.	Use No. 6 Rubber	Table on Page 143
	Continuous Duty	125% of 42 = 52.5	Use No. 4 Rubber	
Lighting* Feeder	Load Current	15 KVA, single-phase 15,000 ÷ 460 = 32.6 amp.	Use No. 8 Rubber, minimum	
Heater	Load Current	40 KW, single-phase (Power Factor = 100%) 40,000 ÷ 460 = 87 amp.	Use No. 4 Asbestos of 90 amp. capacity	
Welder	Load Current	17 KVA, single-phase 17,000 ÷ 460 = 37 amp.	Use No. 6 Rubber	
Power & Light Feeder	Minimum Capacity	125% of motor rating plus (lighting plus appliance load) 125% of 42 + (87 + 37) = 177 amp.	Use No. 4/0 Rubber of 225 amp. capacity. Note: phase C has heaviest load.	
Power Mains	Minimum Capacity	125% of 90 + (19 + 32 + 45 + 42 + 87 + 37) = 374.5 amp.	Use 2 sets of 4/0 in parallel. A demand factor might have been applied if machines were not all to be operated at same time. However, to allow for future load, the full name-plate ratings have been used in calculating feeder sizes.	13, 3
Capacitor	Load Current	50 KVA, three phase 50,000 ÷ (460 x 1.73) = 63 amp.	Use No. 4 Rubber	
Power Service	Two 4/0 in parallel		Use same capacity as Power Mains	

*For load distribution see [illegible] circuits a, b and c [illegible]



***RUBBER SHEATH CABLE** used for flexible weatherproof connections from conduit fittings to outdoor floodlights*

installing wire and cable of *adequate capacity* for present as well as future requirements, thus providing for freedom from interruptions, lower maintenance costs, and higher efficiency.

Installation

Some important points on installation of wires and cables are:

1. Determine features of building construction, also location and type of supports.
2. Investigate conditions in departments through which conductors will be run.
3. Use wire and cable having sufficient capacity for future loads.
4. Use conductors having proper covering or finish to meet chemical and mechanical exposures.
5. Make runs short and avoid duplicate circuits in the same run.
6. Arrange conductors for ease of tracing and locating of faults.
7. Prevent abrasion of insulation when conductors are pulled into conduits and ducts.
8. Provide for drainage of ducts and conduit.
9. If not enclosed, isolate conductors on circuits up to 6,600 volts between phases, by placing them at least 8-ft. above the floor or other working surface.
10. For an overhead run of lead-sheathed cable, use a messenger cable and put hangers close together.

Maintenance

At least once a year, and more frequently, depending on operating conditions, the maintenance man should test insulation resistance on all circuits. The conductors should be disconnected at both ends of the circuit. The ends must be clean and dry to prevent leakage. Measurements should be made between the insulated conductors as well as between each conductor and the conduit.

A record of the results of tests should be kept. When an appreciable drop in insulation resistance is observed, further checks must be made to determine the cause of the trouble.

The amount of insulation resistance for the various sizes and capacities of wire and cable are given in NEC, Section 3018. The values apply where the Code has jurisdiction, represent good practice, and are for minimum conditions.

Many wiring failures can be attributed to excessive heating or overloading. After the circuit has been put in operation, a check should be made at its warmest point to determine if the operating temperature is within the limits assigned to that particular grade of insulation. If the temperature of the conductors is higher than the specified limits, suitable corrective measures should be taken immediately.

Some maintenance points are—

1. Check circuit loadings by use of an ammeter and definitely determine that the maximum loads do not exceed the safe rating of the conductors.
2. Provide sufficient ventilation, especially for massed conductors.
3. Inspect connections for cleanliness, and tighten lugs or terminals.
4. Remove temporary alterations or replace them by permanent wiring.
5. See that all feeders and circuits are protected with overload devices, which correspond with NEC capacity ratings.
6. Check conduit runs for condensation and drainage.
7. See that single-conductor a.c. feeders do not cause inductive heating in clamps, conduits and metal ducts.
8. Check for vibration, also chafing of conductors caused by loose or damaged conduits and fittings.
9. Check grounding connections of boxes, cabinets, conduits and raceways.
10. Examine wall-bracketed runs for impact from material-handling equipment.
11. Clean all insulators on open wiring and buses.
12. Check lead sheaths at ends of duct runs to see if any corrosion, electrolysis or crystallization is occurring.

Where many circuits of various conductor sizes and grades of insulation are in use, a complete set of records

***SUBMARINE CABLE,** 34.5 kv., 3-conductor, 350,000 cm., on oil drums before being sunk in Bear Creek, Md.*

becomes a valuable aid and reference.

These records may consist mainly of single-line diagrams of all circuits on the property. Separate diagrams should be made for power, lighting, signaling and communication services; each diagram indicating conductor size, grade of insulation, operating voltage, method of run, color code, and date of installation.

Common Types of Portable Cords or Cables

Type Letter	Size Range, Number	Voltage Limit	Application
POSJ	18 and 16	300	Light duty pendant or portable
SJ	18 and 16	300	Medium duty pendant or portable
S	18 to 10	600	Heavy duty pendant or portable
OSJ	18 and 16	300	Medium duty, oil, acid, etc.
OS	18 to 10	600	Heavy duty, oil, acid, etc.
C	18 to 14	300	Light duty pendant
P	18 to 14	300	Light duty pendant
K	18 to 10	600	Braided medium, heavy duty
W	8 to 4/0	3000	Heavy duty portable cable

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For Rough and Tumble Service!

¶ Where there's need for Electrical Control Apparatus that stands the rigors of modern speedy production, there you'll find "3C" controls.

¶ Typical of these brawny "3C" devices is the Bulletin 101, Type RD, Heavy Duty Mill Master Switch.

¶ A quick examination of this Switch shows why it meets with instant approval, and renders yeoman service where the going is heavy.

¶ It stands up, not only because of advanced engineering design developed through years of practical experience, but also because it has "wear-resistance" built into it.

¶ Strong cast iron housing • • • liberal mounting feet to insure non-rocking installation • • • a brute of a handle that invites you to slam it back and forth • • • needle roller bearings • • • Bakelite cams • • • oversize shaft • • • Double break silver contacts • • • contact fingers interchangeable with those in Bulletin 101 Type F. R. Foot Switch, Bulletin 102 Type C. L. Cam Limit Switch and Bulletin 102 Type H. L. Hatchway Limit Switch • • • no relative motion between lever and shaft • • • square shaft snugly fitting square hole in cams eliminates cam movement on shaft • • • entire cam and shaft assembly easily removed with no disturbance to contact finger assembly.

A folder fully descriptive of this switch is yours for the asking.

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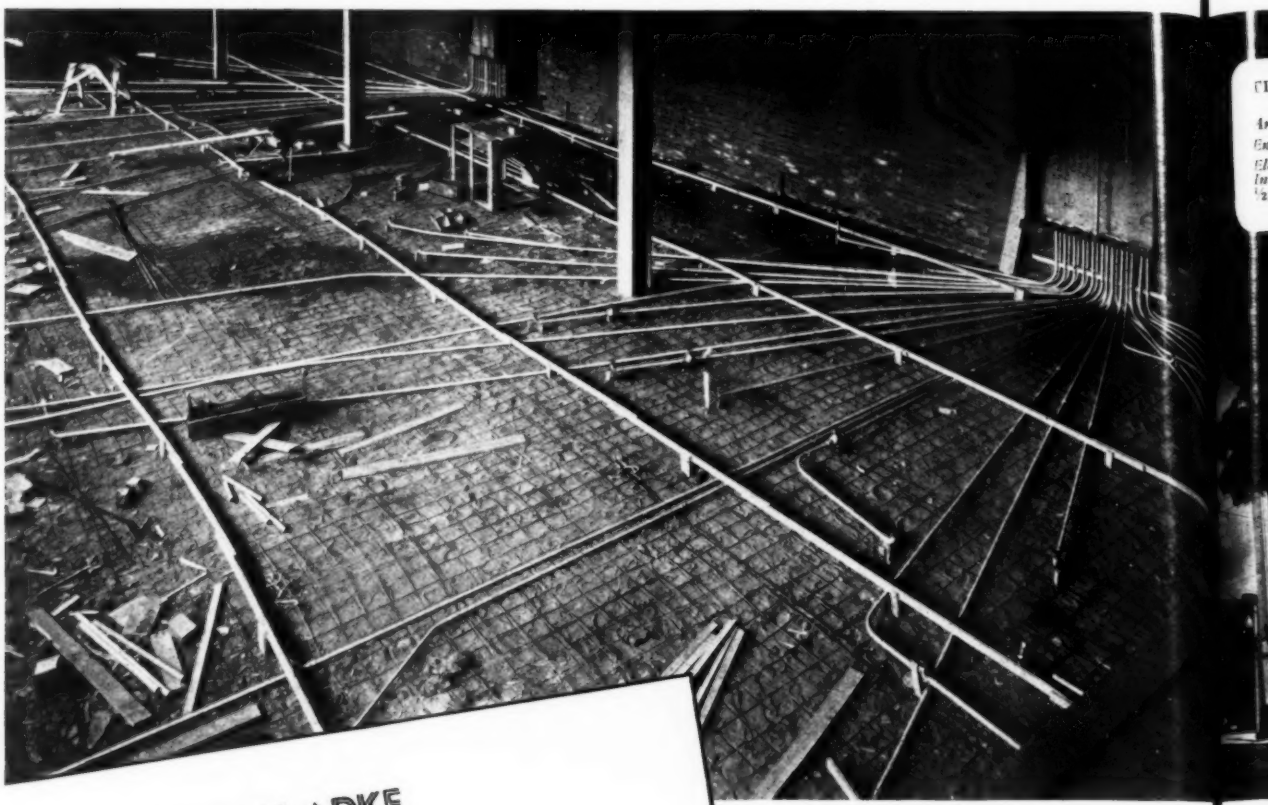

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ELECTRIC COMPANY INC.
-ELECTRICAL-CONTRACTORS-

137 6TH. ST., N.E.
CANTON, OHIO

October 17, 1939

Steel and Tubes Division
Republic Steel Corporation
Cleveland, Ohio

Gentlemen:

We used ELECTRUNITE STEELTUBES for practically all branch circuit work in Timken Vocational School

It had been our intention to use STEELTUBES for suspended ceiling work and rigid conduit where buried in concrete, but after a trial installation of STEELTUBES in concrete we were so well satisfied with the results that we eventually used STEELTUBES for branch circuit work in concrete as well as in suspended ceilings.

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Hilscher-Clarke Electric Company

By W. B. Clarke

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TIMKEN VOCATIONAL HIGH SCHOOL
CANTON, OHIO
Architect: Office of Charles E. Firestone.
Engineers: John Paul Jones, Cary and Millar.
Electrical Contractors: Hilscher-Clarke Electric Co., Inc. 76,000 feet of ELECTRUNITE Steeltubes in ½, ¾ and 1-inch sizes.

tation sold another contractor on BES IN CONCRETE!

● That experience is the best teacher is proved again by this statement from Hilscher-Clarke Electric Company, Inc. — the electrical contractors who installed 76,000 feet of ELECTRUNITE Steeltubes in the wiring system of one of the outstanding schools erected in 1939.

Have you tried ELECTRUNITE Steeltubes in concrete? Use this modern raceway for wiring on your next job — and let its many easy-handling, easy-working and cost-saving advantages demonstrate why you should continue to use it, both in concrete and exposed work.

Steel and Tubes Division
REPUBLIC STEEL CORPORATION
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Greenlee TOOLS

TIMESAVERS and PROFIT-MAKERS FOR THE CONTRACTOR

Cable Puller

No longer is it necessary to use cumbersome, heavy equipment for pulling in cable. The Greenlee anchors right to the conduit through which the cable is to be pulled and is easy to handle and simple to operate.

Knockout Tools

Greenlee Punches and Cutters make it easy to enlarge holes in switch boxes, cabinets, etc. They form clean-cut holes quickly and accurately, without reaming or filing.

ASK FOR CATALOG NO. 31E if you don't have a copy. It shows these tools as well as others of interest, such as Hydraulic Conduit and Pipe Benders, Joist Borers, Hydraulic Pipe Pushers and Electricians' Bits.

GREENLEE TOOL CO.
ROCKFORD ILLINOIS

GREENLEE TOOL CO., Rockford, Illinois

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My Jobber is..... EC 12-39

To Keep Large Shovel Level

Automatic leveling of the world's largest electric shovel is achieved by an arrangement of four small mercury tilt switches. The shovel is used by the Binkley Coal Co. of Missouri, for strip coal mining. It weighs 1,250 tons, has a 33-cu. yd. dipper, and was made by Bucyrus-Erie. It is powered by 32 motors totalling 2,400 hp.

Savings in power consumption are realized by doing away with the need for swinging the machine when it is not level. In addition, it is reported that delays are reduced by eliminating interruptions in the digging cycle.

TINY MERCURY SWITCH *in clips, one of four mounted on a plane table.*

The mercury switches are mounted on a plane table. When the shovel tends to settle, the plane table tilts and causes mercury in the switches to flow from one end of the switch tube to the other, thus completing a circuit. This circuit actuates motors of independent, high-pressure pumps connected to several hydraulic jacks which level the huge structure, at the same time releveling the plane table and returning the mercury switch to open-circuit position. Each switch is connected to relays which control the interlocking electrical devices and fluid valves.

Continuity By Duplication

To provide for continuity of electric service a number of new switching stations were installed at the Avon, Calif., refinery of Tidewater Associated Oil Co. The installation, made by the Pacific Electric Motor Co., complies with the ideas of the company's electrical engineer, N. A. DeLew, that a duplicate set of facilities should be maintained for every piece of equipment.

All switches and contactors are duplicated in the switching houses. Motors near the stills are operated by automatic switches and remotely controlled from pushbutton stations. Feeder cables are run on racks directly beneath the floor, and are accessible by removing loose sections of heavy planking.

The cables are lead-covered. They enter the switching houses from underground boxes, branch out to racks on

ALWAYS ON THE LEVEL—*Mercury tilt switches operate hydraulic jacks to keep this huge stripping shovel level. (General Electric Vapor Lamp Co. photo).*

See how simple this New Switch is!

Type T-44 General-purpose

THIS new time switch is the smallest, simplest G-E time switch you've ever seen. It's a brand-new switch, for use indoors or outdoors, and although it is lightweight and housed in a smaller, more attractive case, it offers you that most important of contractor advantages—

Quick, Profitable Wiring

When it comes to wiring the switch, the new Type T-44 has these advantages — plenty of wiring room beneath the terminal block, five standard knockouts, and clearly indicated connections. These simplify your job, eliminate work. Furthermore, the switch is hinged at the side, can be held with one hand. You can install it fast—and then you can forget it, for it's built for service.

It's a simple matter to make connections to this switch. And it's easy to set the time after it's mounted

The new Type T-44 is exceedingly simple. There are fewer parts to wear, fewer places for trouble. It is provided with a reliable electric drive—the well-known Telechron motor. And its silver contacts are conservatively rated at 35 amperes.

In short, here's a new time switch that makes every installation a profitable job for you. To find out more about it, ask for Publication GEA-1427K at your G-E office or write General Electric Company, Schenectady, N. Y.

The sturdy, weatherproof case houses a mechanism that is simple in design, reliable in operation

GENERAL ELECTRIC

440-130

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THE HARDEST METAL Made by Man

HELPS YOU DRILL HOLES 75% FASTER THAN EVER BEFORE

Now you can use Carboloy cemented carbide —harder than the hardest steel—almost as hard as the diamond itself—to drill concrete, tile, brick, porcelain, etc. 50% to 75% faster. With this amazingly fast drill metal you not only cut drilling time at least in half but you also get up to 50 times longer life per each sharpening.

Carboloy Drill points—used in any rotary electric portable drill—are safe on fragile work, quieter operating, drill cleaner, more accurate holes, eliminate slow, monotonous chiseling. See your dealer or write direct for complete details.

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CARBOLOY MASONRY DRILLS

New!!
TRICO
UNBREAKABLE GRAVITY FEED OILERS

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NO GASKETS TO LEAK
50% LESS WEIGHT
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AMERICA'S FINEST GRAVITY FEED OILER. MODERNIZED AND STREAMLINED TO HARMONIZE WITH ADVANCED IDEAS OF MACHINE DESIGN. 12 DISTINCTIVE FEATURES—METAL PARTS CADMIUM-PLATED FOR BEAUTY AND EASY-CLEANING. 3 STYLES IN ONE, TWO, FOUR AND EIGHT OZ. CAPACITIES.

WRITE FOR BULLETIN No 26

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

the sides of the building and feed directly to equipment above the floor. Duplication is carried through to services to individual buildings and transformer banks.

In addition, the duplication of facilities (1) provides flexibility to the electrical system, thereby minimizing costly and dangerous shutdowns through the coordinated stages of cracking and distilling crude oil to derive gasoline; and (2) permits alterations to be made quickly for new equipment or processes.

Electric "Eyes" In a Steel Mill

Photoelectric cells are being used to detect holes in tin cans. A bank of "eyes" has been installed in a steel mill, to keep watch on the thin sheets of steel as they race on their way to become tin cans. The sheets travel at the rate of 700 feet per minute. These "eyes" not only see tiny holes which are as small as one sixty-fourth of an inch in diameter but they also operate a device to mark each hole.

Number and Kind Of Instruments

How many and what kinds of instruments a maintenance man should have for his immediate use depends on the size of the plant, operating conditions, loads to be measured, kind of circuits and other factors. The best guide to the selection of instruments is to use a specific example.

Consider a plant which has 2,300-volt, three-phase, three-wire, 60-cycle service. The voltage is stepped down to 440 volts for 50 motors, a total connected 500 hp., ranging from ¼ to 100 hp. Normal motor currents range from 0.6 to 125 amp. In addition there are welding and heating loads, also lighting on 110 volts.

The best instruments to use are the portable type with knife-edge pointer and mirror scale. They should include—

1. Voltmeter, double range 0–150/600 volts, moving iron type, 0.5 per cent accuracy.
2. Ammeter, double range 0–0.5/1 amp., moving iron type, 0.5 per cent accuracy.
3. Ammeter, double range 0–2.5/5 amp., moving iron type, 0.5 per cent accuracy.
4. Wattmeter, polyphase, 1–2.5/5 amp. normal, 5/10 amp. maximum current circuit, 100–150/500–600 volts, 500/1000-250/5000 watts, electro-dynamometer type, 0.5 per cent accuracy.
5. Two wattmeters, (to provide an alternate) each single-phase, 2.5/5 amp. normal, 5/10 amp. maximum current circuit, 100–150/500–600 volts, 250/500/1250-/2500 watts, 0.25 per cent accuracy.
6. Two wattmeters, (to provide an alternate) single-phase, if 0.25 per cent accuracy is too good, some range can be obtained with 0.5 per cent accuracy, but with approximately 75 per cent scale length.
7. Two current transformers, portable, primary 10–800 amp., secondary 5 amp., accuracy suitable for use with above instruments.
8. Industrial analyzer, (as an alternate for separate instruments) such as the Weston Model 639, having self-contained

SPOTTING DEFECTS *in conduit at The Fibre Conduit Co., Orangeburg, N. Y. A mercury-vapor lamp with a 33-in. tube mounted over a reflector furnishes illumination throughout the interior of conduit in 8-ft. lengths. A lamp is placed at one side of each of the inspection benches which are at the discharge end of the continuous process driers. Imperfections and irregularities on the inside of the tubes not only are shown but actually magnified. (General Electric Vapor Lamp Co. photo).*

ranges 5/25/125 amp., 150/300/600 volts, 1/2/4/5/10/20/25/50/100 kw., and 0.3–1–0.8 power factor meter range. With the analyzer two portable external current transformers having connections for 10 to 800 amp. primary, and 5 amp. secondary, should be used to extend the range above 125 amp.

The industrial analyzer, is a combination instrument. It consists of a voltmeter, an ammeter, a wattmeter and a power factor meter mounted as a unit. Accuracy is not of as high degree as that for separate instruments, and is as follows: ammeter and voltmeter 1 per cent; wattmeter 2 per cent; power factor meter 1 per cent. Particular advantages of the combination instrument are portability and ease of use; connections to a single unit are much easier and simpler than for several instruments.

For Molasses In January

A grain mixture sweetened with old-fashioned molasses is one of the specialties of P. J. Oesterling & Son, Inc., Butler, Pa., manufacturer of scientific stock feeds. But mixing the formula was impossible during cold weather because molasses could not be pumped through the pipes.

Mr. Oesterling's solution to the problem was the use of electric heat. He

OTHER DEVICES, electrically operated, in the feed mill are: hand-warmer at left of workman's head, clock and inter-departmental telephone at right, bag stitcher in foreground.

secured a 60-ft. length of industrial heating cable, and had it wrapped on the pump, on pipes leading from the tank, and on pipes leading to the mixer. A thermostat was connected to the cable so that the current could flow at any time to keep the molasses in a fluid state and ready for use.

Asbestos cement was used for heat

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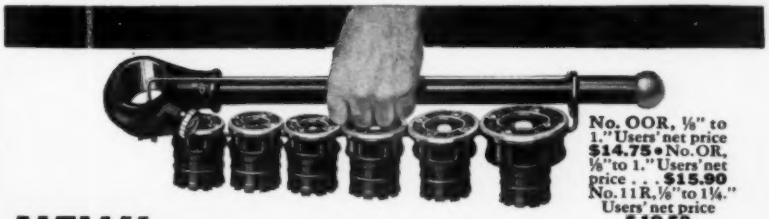

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YOU GET valuable new speed and strength in these new RIDGID ratchet threaders for conduit and pipe from ⅛" to 1¼." Powerful design of all-steel malleable-alloy. Die heads snap out easily for changing, snap into ratchet ring from either side, can't fall out. Separate sets of semi-high-speed tool steel chaser dies, accurately cut, long wearing, easily removed for regrinding.

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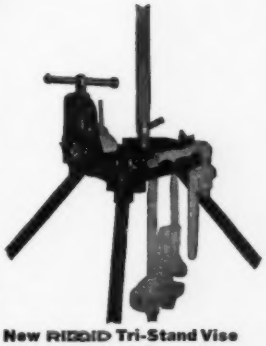
THE RIDGE TOOL CO. • ELYRIA, OHIO



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RIDGID PIPE TOOLS

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This wire is approved for use in raceways as follows:

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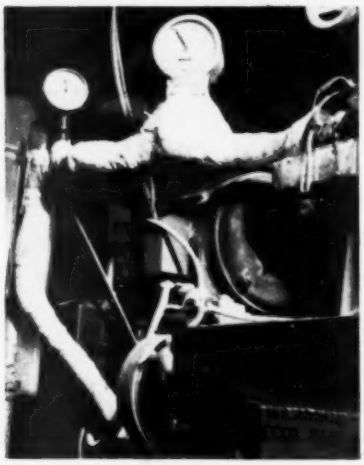

HEATING CABLE was wrapped and packed on the molasses line leading into the mixer.

insulation and packed around the cable and pipes. Then the packing was wrapped with muslin tape and sealed with asbestos cement. The job was completed at a total cost of only $13.50 for materials. The mixer worked perfectly even on days when the mercury hovered around zero.

Mr. Oesterling is a believer in doing things in a modern way. He has installed other electrical devices in the feed mill (see illustration).

Rolling Mill Motors Clean and Cool

At the new rolling mill of the Bridgeport Brass Co., Bridgeport, Conn., important motors and motor-generator sets were inclosed in housings through which cooled air was circulated under pressure from a common ventilating system. Air pressure within the housing prevents infiltration of metal dust and fumes. Inclosing the driving equipment was a departure from the usual steel rolling mill practice of locating the main motors in a separate room to protect the motors from dust and fumes.

A separate ventilating system was provided for the m-g set and 1,000-hp. d.c. reversing motor associated with the hot and cold breakdown mills, and also for the two 800-hp. d.c. motors driving the rolls of the four-high tandem cold rundown mill. The cooling system not only allowed cleaner operation but improved the physical plant layout.

In the case of the m-g set and 1,000-hp. drive the special cooling permitted the machines to be located close together. This arrangement was made possible where ambient temperatures were high and production space valuable.

Heating Cable for Water Service

Any cold day in winter some maintenance man may be called to thaw frozen water pipes on the plant premises. But to avoid the thawing operation, industrial heating cable can be applied before cold weather sets in.

An interesting installation has been made in a Canadian town, that is good experience for similar applications in industrial plants. Here is what was done, according to Allen K. Grimmer, town manager of Temiskaming, Quebec, and reported in *Engineering News-Record*.

In Temiskaming, the thermometer sometimes registers 60 deg. below zero. There are a number of temporary water service pipes there at a large industrial plant. Two methods of protection have been tried.

1. Inclose the pipe in a wooden box, 8 by 8-in. This box is inclosed in a second one with a removable cover about 30-in. wide. The surrounding space is filled with sawdust and electric heat is introduced by using industrial heating cable. The cable usually heats to 175 deg. F. Sometimes two or more cables are spliced together, which reduces the temperature of the cable, but the heat developed is adequate to prevent freezing. Sixty-foot lengths of the heating cable are rated 400 watts, 115 vots.

2. When boxes are not used and temporary services cannot be placed more than a few inches below the ground, the "soil" heating cable is placed in a conduit laid parallel to the water pipe and close to the surface. The cost of operation is cheap because current charges are only one-half cent per kilowatt-hour, and on this basis a 60-ft. length of cable in constant use costs $1.10 per month.

Daily inspection is maintained on all hydrants in the winter. When frozen, a 60-ft. length of heating cable is wrapped about the part of the hydrant exposed above ground. The generated heat apparently travels down through the hydrant barrel and spindle, thus thawing the ice which, when started, is removed by opening the hydrant and discharging it through the outlet. During this process the hydrant is covered either by canvas or other protective means.

A wood stave pipeline exposed on the surface causes trouble in winter because of leakage and consequent ice formation on streets; sometimes to a depth of 4-ft. Lengths of cable are installed so that open channels are maintained to catch basins. The cables are laid in conduits and throughout the winter will maintain an open channel in the ice, about 18-in. in diameter.

The Electrical Committee Who and Why

[FROM PAGE 14]

representation of the governmental and independent agencies. Among these non-governmental groups with inadequate voting strength is NECA.

In earlier years, like the electrical manufacturers and the electrical utilities, contractors were represented by one vote. This was during the period when the bulk of votes was by independent-minded inspector-engineer representatives. But in recent years, the utility and manufacturer groups have each obtained the status of a "major" interest with seven votes. The contractors, however, have but 2/7 of this "major interest" representation.

Many contractors feel this is not a sound situation. They feel that their interest is properly as great as that of any other commercial group.

Public Interest Weak

A healthier Code-making representation would assuredly exist if the governmental representation, plus the free agencies likely to cooperate with them, should number well over a third of the membership on the Electrical Committee, as well as its Article Committees. It should not be possible for agencies with commercial interests, by pressure long applied, to make the representation of governmental agencies on the Electrical Committee ineffective. For if this pressure continues, it may drive these governmental agencies to some other method of code-making, more satisfactory to themselves, such as control by the United States Bureau of Standards.

Some think that the governmental agencies should number at least 25 members, instead of 10. This would give them 25 out of 66 members. It would be a sounder and safer representation. The ability of the governmental agency representation to secure constructive Code changes would still depend upon the extent to which other agencies directed their representatives on the Electrical Committee to support the governmental group.

If after arriving at a fair percentage representation, it seems best to scale down the total number of representatives on the Electrical Committee, this could be done, still preserving the same relative representation. But with pressure removed, the controversial atmosphere in which Code-change consideration has been breathing, will be clarified. And this would be well for the electrical industry, for controversy is no atmosphere for constructive code making.

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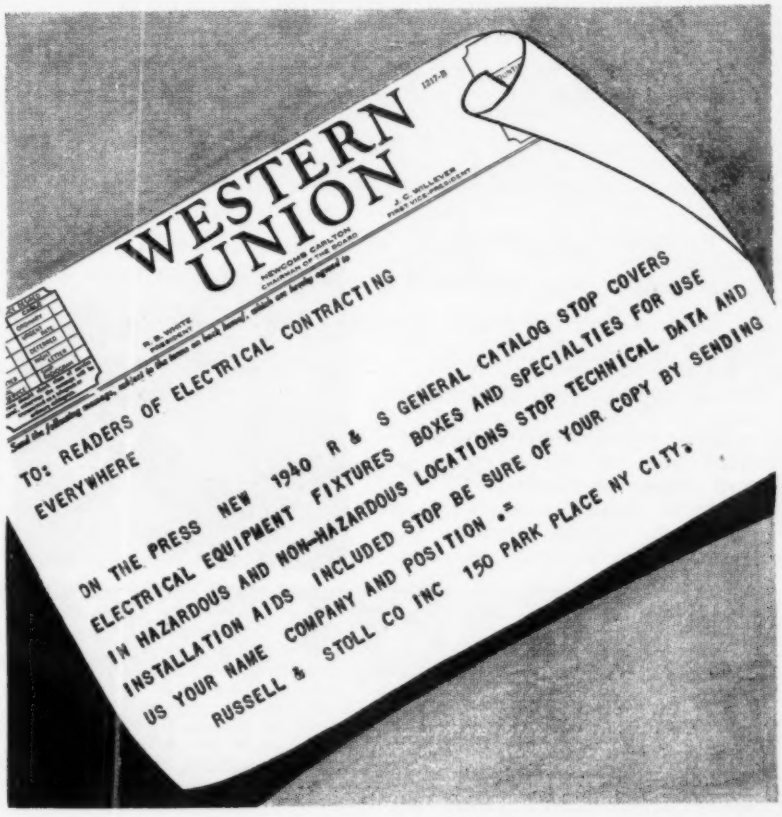
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Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Size of Splice Box

Q. *"Is it permitted by the Code to splice service cable used for range circuit, using a four inch octagonal box to hold splices in two No. 6 and one No. 8 wire?"—R.B.C.*

A. According to the second table in Section 3705a (page 115) the maximum number of No. 8 wires permissible in the 1½ by 4-in. octagonal box is four. Such a box should not therefore be used for splicing two No. 6 and one No. 8 wires which give a total of six wires in the box.

Grounding Conductor

Q. *"For a common ground conductor, would it be permissible to use a No. 8 insulated or bare conductor fastened to the surface of a stud and run inside a wall and connected to a cold water pipe under the house without using additional metal protection?"—G.K.B.*

A. If the conditions of Section 2595a have been met so that a common grounding conductor is permissible, the installation of the grounding conductor as outlined in the question would meet the requirements of the third sentence of section 2591c. The installation should be approved, however, by the inspector before the wire is concealed by the closing in of the wall.

Errata

Q. *"In regard to a question in your June issue by F. M. McE. about 3-way and 4-way switches, the answer says the hot or underground wire is carried to and through the switches. Does this mean the ungrounded wire? As I read the Code, I took it to mean the ungrounded wire and the grounded wire must run through the same conduit and boxes."—R.B.C.*

A. The word "underground" is a typographical error. Of course it should be "ungrounded." Sorry.

Armored Cable for Three Phase

Q. *"Is it permissible to use regular 3-wire armored cable to supply current to 3 phase motors from a 3 phase 4-wire system? From a 3 phase system with one phase grounded?*

"My reason for asking is that my interpretation of the 1937 Code says that it is not, (Article 250, Section 2555). This is a vital rule which ought to be strictly understood by all electrical contractors and inspectors.

"My second question is, are regular armored cable ends considered threadless fittings?"—D.S.

***INDUSTRIAL COMMISSION** men of Wisconsin. Electrical engineer John Wise (left) looks after the State Electrical Code. Walter F. Simon, supervisor of apprenticeship, has charge of electrician apprentices throughout the state. Both have attained national prominence in their fields, Wise more recently for his pioneer work in setting up safety rules for electric fences and Simon for his leadership in the Wisconsin Apprentice Indenture Plan.*

A. In a 3 phase 4-wire system, the phase wires are not over 150 volts to ground and therefore a 3-wire armored cable is permissible for use on a 3 phase power line derived from a 3 phase 4-wire system having a grounded neutral, even though the neutral is not carried in the motor circuit.

The armored cable connectors would be considered threadless fittings, in reference to Section 2555a.

Ground Clamp Location

Q. *"Would a common grounding clamp on a water pipe, located under a house which has no basement, but which has an opening thru which you can get under the house, be considered as accessible as required by section 2601 paragraph b?"—G.K.B.*

A. Ground clamps installed as described above would be accessible within the intent of section 2601b.

Service Capacity

Q. *"A new house, 36-ft. by 26-ft., is one story high, with an attic to be finished later. I figured three 15 amp. circuits and a computed load of approximately 26 amps. which would allow a No. 8 2-wire entrance. I wanted to use a 35 amp. 115 volt multi-breaker service center providing three 15 amp. circuits. The three circuits could add up to a total of 45 amp. but as there is no main overload protection, would the Code require a No. 6 entrance in order to provide for the possible load? An electrical salesman told me that the entrance conductors and switch capacities in a case like this are figured on a percentage of the total added circuit ratings."—G.K.B.*

A. It is assumed that as the attic is finished later as living quarters, a new service adequate for the ultimate load is to be installed. The area of the two floors will then be—$36 \times 26 \times 2 = 1872$ square feet. Applying Section 2107 — 1872×2 watts per sq. ft. = 3744 watts plus (kitchen, dining room and laundry) 1500 watts = 5244 watts. 5244 watts ÷ 115 volts = 45.5 amps. or approximately 45 amps. This calls for three 15 amp. branch circuits, and if a main service disconnect is to be used, according to Section 2357, this would require on a 2-wire service, a main service switch or circuit breaker of not less than 60

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RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET **RACINE, WISCONSIN**

Questions on the Code

[FROM PAGE 44]

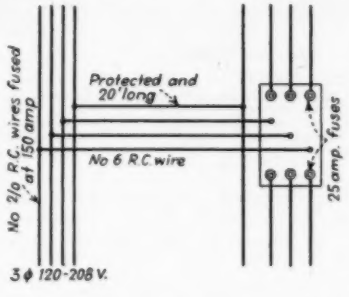
amp. capacity. Of course, if each of the three circuits is to be protected by a 15 amp. circuit breaker, according to Section 2351a, no other main service switch or circuit breaker is required.

Now as to the size of the service conductors. Section 2305a requires that their capacity be computed according to section 2202 and sub-paragraph C (of 2305) requires that it be not smaller than No. 8. According to Section 2202, 1872 (sq. ft.) × 1 watt (per sq. ft.) + 1000 w. (for appliances) = 2872 watts. 2872 w. ÷115 v. = 25 amps. (approx). The service wires, therefore, should comply with Section 2305c and be not less than two No. 8 wires. The salesman referred to should probably join the Inspector's Association (IAEI) and study up on the Code, or stick to selling, or both.

Unfused Taps

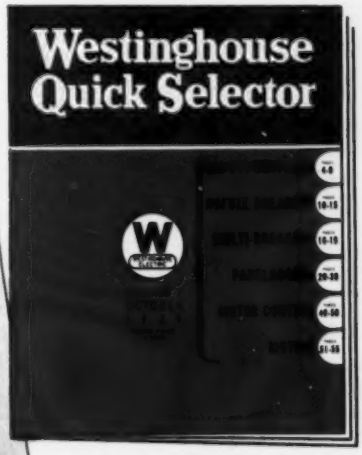
Q. *"I would appreciate your opinion on the enclosed diagram as to its conforming with the N.E.C. In fact it conforms with 2434-d, even though the unfused tap terminates in sets instead of a set of fuses. I think that additional 50 ampere fuses for the sub-feeder would have no practical value. There will never be any additional branches connected to this sub-main.*

"Would plug fuse cutouts be acceptable for the branches providing the proper spacing for the voltage applied was maintained? The system is a 4-wire 208-120 volt."—W.M.C.



A. As the two 25 amp. fuses connected to each phase wire limits the current on each #6 phase wire to 50 amp., the protection required by the Code is met. However, a strict compliance with 2434-d, does not permit of this, although the intent of the Code has been met. Therefore a local Inspector's ruling on this matter should be obtained before using this method.

GOT YOURS?



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Estimating

MACHINE PIPE WORK

Figuring conduit threading, cutting and reaming time on pipe machines is a simple stop watch operation. To compare hand work take an average time analysis over a full day to compensate for the human element. A mechanic may install 1¼ conduit twice as fast at 10 A.M. as he will perform the same operation at 4 P.M.

Machine time figures may be computed to a high degree of accuracy by timing only a few operations. But, the handling of conduit, measuring, setting up dies, etc., are still subject to variations depending on skill, experience, fatigue and other human factors.

The following figures give time in seconds for "net" operations on a Beaver Model B portable pipe machine. They are based upon machining time and do not include handling before and after. The time is shown in seconds. Cutting time is based upon the use of knife cutoff which leaves a square end with minimum burr. Wheel cutters would reduce the time shown one-half.

MACHINE CONDUIT THREADING

Pipe Size	Cutting	Threading	Reaming
½	10	15	2
¾	10	15	2
1	12	16	3
1¼	12	17	3
1½	14	18	4
2	16	19	4

Time in seconds

PUSHING CONDUITS UNDER ROADWAY

The Beach Electric Company of Newark, N. J., used a large hydraulic conduit bender to push two 3½-inch conduits under a 24-foot roadway for service to a school building. The conduits were four feet below the road bed.

A hole 13-feet long and of sufficient depth was dug at one side of the road. Only the plunger and hydraulic mechanism of the bender was used. A 12-in. by 12-in. block was placed between the bender and the trench wall. Only a six inch "push" could be made without resetting the plunger, hence blocks and short nipples were inserted after each six inch gain. A plugged nipple with zig-zag teeth cut into it was used on the front end of the conduit as a cutting point. As each length went under the road an additional length was screwed on and the process repeated.

The ground was a mixture of coarse dirt and rocks. No large rocks were struck and no deflection of the conduit resulted.

Total time for "pushing" the two conduits under the road 29 m.h. Average "gain" per man hour—20 inches per m.h.

A SEWAGE PLANT CONTROL PANEL

The recently completed electrical installation at the Auburn, Indiana, sewage disposal plant presented interesting labor data on the installation of the control panel. The contractor made a careful labor record for future reference on similar installations.

The panel weighed 3200 pounds and contained the following equipment:

1—200 ampere 3 phase 4 wire main circuit breaker
1—30 ampere single phase 220 volt lighting breaker
Current transformers and metering facilities
Control equipment for motors ranging from ½ hp. to 5 hp. including—
20 circuit breakers for power
8 circuit breakers for lighting—15 amp., 110 volt
6 start and stop stations
6 cycle clocks
6 selector stations (manual, automatic, off)
3 reversing contactors
2 three point stations
1 three point pilot station
1 sequence selector
1 alternator

The panel was located on the ground level floor and 15 feet from a door. It was shipped in sections and the labor required for mounting each section was:—

SETTING FLOOR TEMPLATE—includes grouting in floor and checking and leveling a heavy gauge sheet steel template, 8 ft. by 2 ft., for all floor conduits. Most of the time was checking and leveling as pouring progressed.
Total time 8.0 m.h.

SETTING THE TUB—includes mounting and setting an 8 ft. by 8 ft. by 2 ft. tub made to fit the template. The tub came minus the prefitted doors, with precut space for pressure clocks.
Total time 8.0 m.h.

UNCRATING AND MOVING PANELS TO LOCATION—The panels came in four sections, each section with complete bus work, ready for interconnecting busses between panels.
Total time 6.0 m.h.
Average time per section 1.5 m.h.

MOUNTING PANELS—includes mounting each section in the tub.
Total time 6.0 m.h.
Average time per section 1.5 m.h.

MOUNTING DOORS—includes mounting the seven doors which had been prefitted and removed.
Total time 8.0 m.h.
Average time per door 1.15 m.h.

ERECTION TIME for complete panel 40 m.h.
Total weight of panel 3200 pounds.
Average weight per man hour as a rough check 80 pounds per m.h.

The fact that the panel was located on the ground level floor and only 15 feet from a door made the total time less than that of other jobs against which it was checked.—*From Continental Electrical Construction Company, Chicago, Ill.*

PRICING SHEET TOTALS

Where more than one pricing sheet is required to list a particular operation, the first sheet is often totaled and the total carried over to the second sheet. This practice often introduces the possibility of entering both the first sheet total and the accumulated total on the re-cap. To avoid this, make a practice of entering the carried over total on the second sheet only, leaving the first sheet total line blank.

These New Models

add Further Opportunity r the Sale of Teletalk... and greater pportunity for the Sale of Materials nd Installation Labor

MODEL 524 has an inbuilt microphone. No manual operation of a "Talk-Listen" switch is required. Simply select station and talk. Available in twelve stations, with and without annunciator feature and twenty-four stations without.

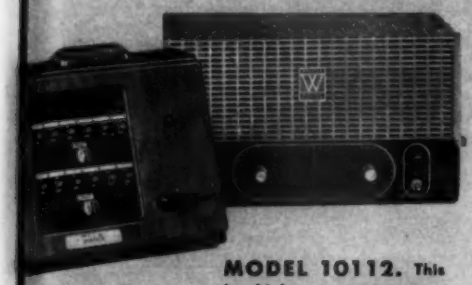
WEBSTER ELECTRIC

Teletalk

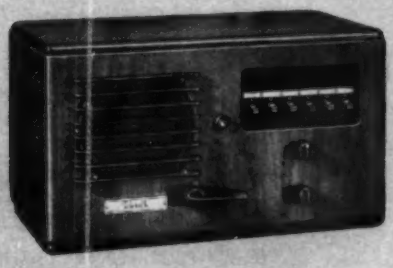
REG. U.S. PAT. OFFICE

Amplified Intercommunication

MODEL 206. This is a new model of six station capacity and is available with and without the annunciator feature. The ideal unit for the small business.



MODEL 10112. This is a high power system especially designed for voice paging in factories or wherever the noise level is high. Twelve and twenty-four station capacities with facilities for group paging.



MODEL 1006 is designed for voice paging in offices. It is available in six and twelve station capacities. Each is equipped with an "all call" feature which permits calling all stations at one time.

THE opportunities for contractors to make money through the sale and installation of Teletalk are now urther increased by the addition of these new models.

hey provide a broader scope of intercommunicaon service. In addition, voice paging systems for oth offices and industrial plants are now a part of he Teletalk line. You can sell them both systems.

his enlargement of the line provides you with two ew and additional approaches to your commerial and industrial customers as well as systems for nstitutions.

When you are selling or installing switches, lightng or power circuits or any other products ordinarily urchased through you, is the ideal time to suggest an amplified intercommunication or paging system.

The profit on the sale is better than ordinary. Many installations require as much as 12,000 feet or more of wire in addition to conduit and junction boxes. Figure out for yourself what your bill for labor would be on installations of this kind.

There is a good three-way profit for any contractor —in the sale of Teletalk and in the sale of material and labor.

Write us for details and literature which describes the entire line. A new catalog is now ready.

Licensed by Electrical Research Products Inc. under U. S. Patents of American Telephone and Telegraph Company and Western Electric Company, Incorporated.

WEBSTER ELECTRIC COMPANY, Racine, Wis., U.S.A. Established 1909. Export Dept.: 100 Varick St., New York City. Cable Address: "ARLAB", New York City

Webster Electric

"Where Quality is a Responsibility and Fair Dealing an Obligation"

UMI

In the News

REED AND WILSON TO HEAD G.E.

Owen D. Young and Gerard Swope will retire on January first as top executives of the General Electric Company. Because of the broad influence of G.E. in electrical affairs and the fact that these men have long rated as two of the nation's foremost industrialists, this is important news to the electrical contractor.

For the past 17 years Mr. Young has been chairman of the board and Mr. Swope has been president. They have operated this industry's largest manufacturing organization, which also embraces country-wide chains of wholesale supply houses and motor service shops. They retire in deference to their own long expressed conviction that executives should step out at 65 or thereabouts and turn the job over to younger men. Young is now 65. Swope is 66. Mr. Young and Mr. Swope will remain directors of the company, with the titles of honorary chairman and honorary president.

They are succeeded by Philip D. Reed, dynamic youthful 40 year old assistant to the president. He becomes chairman. And Charles E. Wilson, rugged, jovial hard working 54 year old executive vice president now steps into Swope's place.

Owen Young began life as a farm boy in upstate New York. He studied law and in 1913 was appointed general counsel of the General Electric Company by Charles A. Coffin, whom he succeeded nine years later as chairman. Mr. Young is a diplomat, with a genius for bringing men's minds into harmony. He twice won international fame, first as the negotiator of the Dawes Plan after the World War, in which he reconciled the European nations to a working plan for organizing the reparations program. Later, when the great nations were drifting into a war in the ether waves for dominance in radio, he went abroad and established an international coordination in communication and broadcasting.

Gerard Swope came from St. Louis and took his first job at a dollar a day in the Chicago G.E. Service Shop. After graduating from Massachusetts Institute of Technology, he joined the Western Electric Company, became sales manager, vice president and director and after the World War was appointed first president of the International General Electric Company and then of the big G.E.

Philip Reed is a graduate of the University of Wisconsin in law. He became vice president and patent counsel for the Van Heusen Products Company and in 1926 joined General Electric as assistant to the vice president. He plays good golf and is a pianist.

"Charlie" Wilson started as a 13 year old office boy with Sprague Electric and the G.E. has been his university. He has served in practically every division of the business. In recent years, until he became executive vice president, he headed the Bridgeport Works, producing wiring materials and equipment and domestic appliances. For some time he directed the policies of G.E. supply distribution. He knows the problems of the electrical contractor and wholesaler. Fishing is his hobby.

MEADE GETS CO-OP. AWARD

Harold E. Meade, vice president of the New Orleans Public Service, Inc., has been awarded the James H. McGraw Award Medal for Cooperation for 1939. The presentation was made at an industry dinner in New Orleans, Nov. 15th, by Earl Whitehorne, representing Mr. McGraw and the Committee of Awards.

MEDALIST. *Harold E. Meade receives the McGraw Award Medal for Cooperation from Earl Whitehorne at an industry dinner in New Orleans.*

The award carried the following citation—

Harold E. Meade, vice-president of the New Orleans Public Service, Inc., some years ago conceived the idea that progress in the development of the local market for electricity is dependent basically upon the knowledge and skill of the wholesale and retail electrical sales people of the community, since it is they who interpret the advantages of the various types of electrical equipment, adapt them to the needs of the individual customer and stimulate the interest of prospects so that they desire to buy. As general sales manager for the New Orleans power company, he proceeded to develop this theory by encouraging, guiding and later organizing a cooperative program for the schooling of the salesmen and sales women employed by wholesalers, contractors and dealers of that city.

He launched his program in 1934, during the progress of two dealer campaigns, promoting the sale of lamp bulbs and IES study lamps, under the leadership of the utility company. Next year he broadened

NEW G.E. EXECUTIVES *are shown with their successors. Owen D. Young (left), retiring chairman; Philip D. Reed, new chairman; Gerard Swope, retiring president and Charles E. Wilson, new president. Mr. Young and Mr. Swope will remain as honorary chairman and honorary president of the corporation.*

There's Money in Decorative Lighting

This Holiday Season

EVERY community takes pride in extending a cordial greeting to visiting friend and passer-by with outdoor decorative lighting. Again, this holiday season, many outdoor lighting contests will encourage people to decorate their homes with effective and novel illumination. Could there be a better way to share in this growing market than displaying and recommending suitable floodlighting equipment?

Novalux floodlights, either incandescent or fluorescent, will make homes sparkle with a new holiday atmosphere. An attractive profit from an easy sale will be the result of your effort when you offer and display G-E floodlights and wiring supplies. For effective light and color to express the holiday spirit, recommend the fluorescent floodlight. From 3 to 200 times as much light, color for color, is obtained as from comparable incandescent sources. Our incandescent Handy floodlight, low in first cost, is suitable for spot and area lighting.

You'll find it profitable to display and recommend G-E Novalux floodlights for decorative lighting.

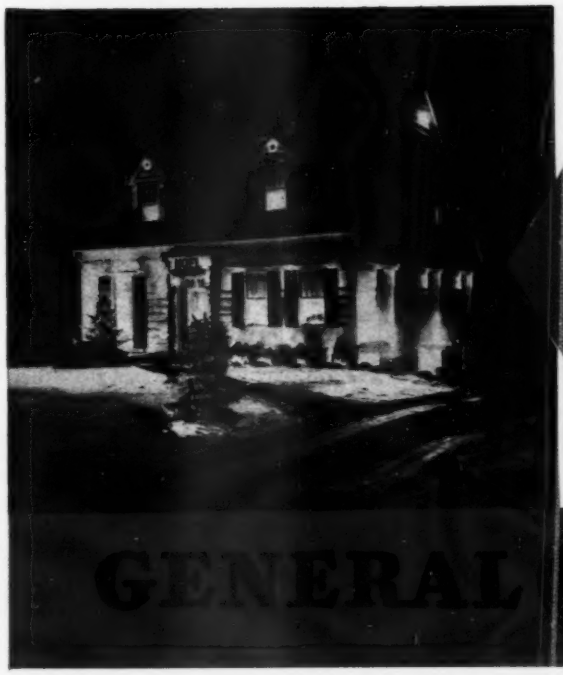
See your nearest G-E Distributor. General Electric Company, Schenectady, N. Y.

FLUORESCENT FLOODLIGHT FOR COLOR

The Type L-53 fluorescent floodlight opens opportunities for colored lighting. The 16-inch fluorescent lamp, which is attracting wide attention for its efficient generation of colored light, makes color-floodlighting amazingly inexpensive to install and operate. This unit gives a surprising amount of well-distributed light with only 15 watts.

HANDY FLOODLIGHT FOR SPOT LIGHTING

The Handy floodlights, L-35 and L-36, are ideal for all small-area lighting. Weatherproof, lightweight, sturdy, and portable, they will satisfy countless requirements around the home and throughout the year. Colored cover glasses are available to create distinctive color effects. Type L-35 uses a 100-watt lamp; Type L-36 uses a 200-watt lamp.



GENERAL ELECTRIC

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[FROM PAGE 50]

the program to embrace all members of the local industry and to cover the entire field of lighting. As the next step, in 1936, he established sales training schools, in which the interests of the several branches of the lighting field were coordinated through local industry conferences. The following year he brought in the two large lamp manufacturers to help in dealer "point of sales" work with an expanded campaign of training and promotion. And in 1938 this program was further refined, extended and implemented through the cooperative participation of the national lamp manufacturers. It was expanded again by the power company until it took the form of a general market development activity embracing not only the domestic field but commercial and industrial sales as well, and applications of heat and power in addition to lighting.

The achievement is the more notable by the fact that it also has constituted an effective demonstration in New Orleans of the practical benefits of good business ethics. For starting in an atmosphere of indifference and suspicion toward cooperative market development, the establishment and maintenance of frank policies of fair dealing between competitors has proved the creative power of team work and produced a new enthusiasm that has definitely advanced both the technique and spirit of marketing within the electrical community.

This highly valuable experience in the progressive education of the individual representatives of wholesalers and retailers employed in the merchandising of electric lighting and appliances within this city has been a fine product of Mr. Meade's early concept. Fired by his imagination and inspiring leadership, and guided by his sound judgment and wise counsel, his idea has gone forward and now the New Orleans balanced program of sales training and product promotion has become the springboard for a nationwide training and promotional activity. Led now by the lamp companies, and designed particularly for the instruction and encouragement of the sales people of lighting equipment dealers, other than utilities, this national program has carried forward the New Orleans idea with promise of even more substantial benefits to the entire electrical industry."

The committee of judges who selected Mr. Meade for this honor included B. W. Clark, president, Westinghouse Electric Supply Company; D. Hayes Murphy, president, Wiremold Company; S. J. O'Brien, president, S. J. O'Brien, Inc.; and P. H. Powers, vice president, West Penn Power Company.

The dinner was attended by 300 members of the electrical industry of New Orleans who gathered to pay tribute to Mr. Meade. W. J. Amoss, general sales manager for New Orleans Public Service, was toastmaster.

REGIONAL A/W CONFERENCE IN NEW ORLEANS

The southern regional Adequate Wiring Conference is scheduled for December 7 and 8 in the Roosevelt Hotel, New Orleans.

The conference, sponsored by the National Adequate Wiring Bureau and arranged by the Electric Association of New Orleans, will be patterned after the successful San Francisco, Chicago and Pittsburgh meetings.

A discussion of promotional experience, methods and policies will highlight the program.

NEW ELECTRICAL COMMITTEE MEMBERS

The United States Conference of Mayors has appointed the following members to the Electrical Committee; voting representatives, W. A. Haig, Milwaukee; Dewey L. Johnson, Atlanta; James D. Lynett, New York; Charles A. Ward, Paterson; R. W. Wiley, San Francisco; alternates, Frank G. Camus, Shreveport; C. S. Whitaker, Durham, N. C.; R. B. Ward, Newark, N. J.; W. D. Guion, Cleveland. The fifth alternate will be named shortly.

George Kimball, San Francisco, has been named in place of Ben P. Foster as alternate to C. George Krueger of the IAABC. Henry J. Morton has been added to the Electric Light and Power Group, succeeding John Noyes who has retired.

ARNOLD PROBE STRIKES IN PITTSBURGH

Electrical contracting firms and individuals in Pittsburgh, their association and officials, and also labor leaders are involved in U. S. Deputy Attorney General Thurmond Arnold's investigation of the building industry. A federal grand jury in Pittsburgh on Nov. 3 handed down indictments charging conspiracy and collusion to defraud the government on PWA contracts in western Pennsylvania over the past three years. Named in the indictments were 45 individuals, twelve electrical contracting concerns and the Electrical Contractors Association of Pittsburgh. Included in the list are Carter Electric Company, Craig Electric Company, G. L. Craig Electric Company, Daniels Electric Construction Co., Franklin Electric & Construction Company, Hess & Barton, Industrial Electric Company, Iron City Engineering Company, Lord Electric Company, MacNeil Electric Company, Morganstern Electric Company, Star Electric and Construction Company.

Additional indictments were handed down on Nov. 6 charging 35 of the individuals with fraud in respect to signing statements to effect that no collusion had taken place in the preparation of bids. Special assistant U. S. Attorney General M. Neil Andrews in charge of the investigation in Pittsburgh, has announced he will probe the heating, plumbing and ventilating contracting work next.

The indictments charged that con-

"Let's call the little redhead!"

tractors would submit bids in advance to the secretary of their association, and the firm bidding the nearest to the average of all bids would be designated to submit his figure as low to the awarding authority. Other firms, it was charged, would adjust their figures above that of the designated low bidder. Furthermore, it was alleged that the association and labor officials, by intimidation, bribes and threat, would prevent nonmembers of the association from bidding.

RLM STANDARDS INSTITUTE MEETS

At the annual meeting of the RLM Standards Institute, in Cincinnati, October 18, the following officers and trustees were re-elected: president, R. W. Staud; secretary, H. A. Barnes; treasurer, W. F. White; trustees, H. A. Barnes, Wheeler Reflector Company; Arthur Miller, The Miller Company; R. W. Staud, Benjamin Electric Manufacturing Co.; W. F. White, Westinghouse Electric and Manufacturing Co., and D. E. Worrell, Quadrangle Manufacturing Company.

COMING MEETINGS

Louisiana Engineering Society—Annual meeting, St. Charles Hotel, New Orleans, Jan. 12-13.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 22-26.

American Society of Heating and Ventilating Engineers—Annual meeting and International Heating and Ventilating Exposition, Lakeside Hall, Cleveland, Ohio, Jan. 22-26.

National Electrical Manufacturers Association—Mid-Winter Conference, Waldorf-Astoria Hotel, New York, Feb. 5-9.

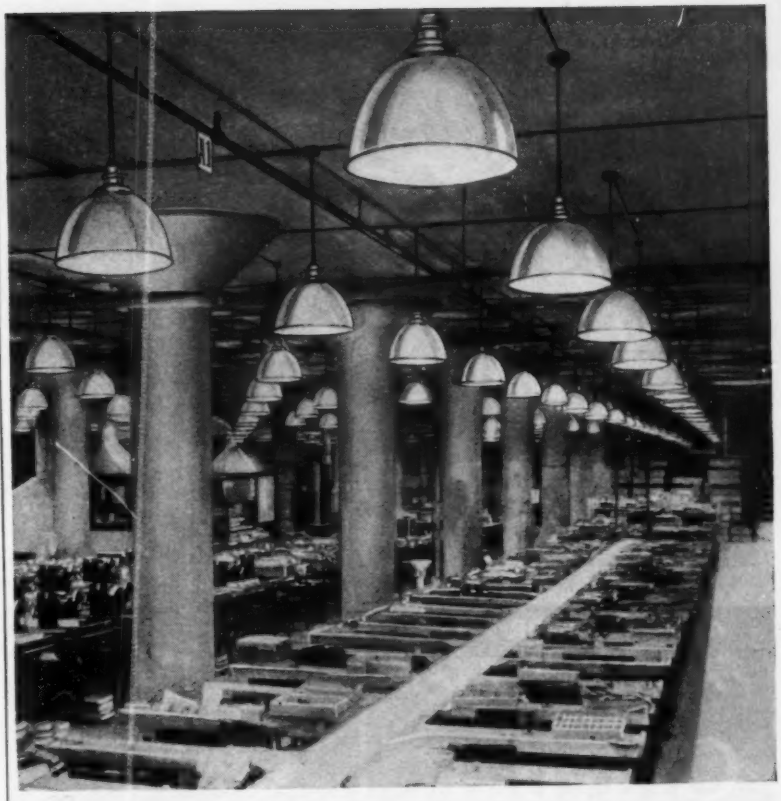
Minnesota Electrical Trade Exposition and Convention Week—St. Paul Hotel, St. Paul, Minn., Feb. 12-15.

MAINTENANCE SHOW IN CHICAGO

Chicago Electrical Maintenance Engineers, sponsored by the Electric Association of Chicago, staged their seventh annual exhibit at the Chicago Lighting Institute, Oct. 31 to Nov. 2. Eighty-five exhibitors, manufacturers, sales agencies, motor repair shops and electrical schools brought out the latest in electrical equipment, wiring materials and lighting. It drew a crowd of 5,000 visitors.

The show attracted electrical maintenance men, motor repair shop operators and electrical contractors from throughout the metropolitan area of Chicago and nearby cities. On Nov. 1, 42 members of the Milwaukee electrical maintenance engineers organization were guests of the Chicago group.

In the motor service field, three prominent Chicago shops, Excel Electric Service Co., Hohman and Hill, Inc. and Sievert Electric Co. manned exhibit booths with their industrial sales staffs.



HOW THIS NEW *FIXTURE* PROTECTS EYES FROM GLARE

It's designed especially to illuminate areas where skilled eyes need protection from glare and injury. Unlike other combination reflector and globe fixtures, it has a deep-skirted reflector which hides its light source from the field of vision. This design permits the use of a diffusing globe of exceptionally high transmission value to obtain increased efficiency and more accurate light control.

"PROTECTO" DIFFUSER

As you look down a row of these fixtures, you see only the pleasing effect of the illumination without the glare that is common to protruding globes. With the high reflection factor of white porcelain enamel, shadows are softened and minute details are clearly revealed. A portion of the light is directed toward the ceiling to eliminate sharp contrasts and improve general illumination. The "Protecto" diffuser is an exclusive Goodrich product. Ask for catalog sheets.

Sold Only Through Electrical Wholesalers

MEMBER OF R. L. M. STANDARDS INSTITUTE

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2902 N. OAKLEY AVENUE, CHICAGO, ILL.

The dependability of this long-lasting friction tape is *built in.* It is made of only top quality fabric and adhesives, scientifically treated to retain pliability and to resist the elements. It handles quickly and easily...adheres firmly. A first-class tape for a first-class job.

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FRICTION TAPE
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OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

How to wire for light and power...

Step-by-step methods fully and simply explained in this new book

Just Out H. P. Richter's

PRACTICAL ELECTRICAL WIRING

Residential, Farm, and Industrial

500 pages, 5½ x 8
illustrated
$3.00

Covers:

I. Underwriters and codes; electrical principles and measurements; basic devices and circuits; wire, sizes and selection; connections and joints; residential and farm motors; etc.

II. Planning an installation; specific outlets; switches and other devices; old work; farm wiring; isolated lighting plants; wiring apartment houses; etc.

III. Planning non-residential installations; non-residential lighting; miscellaneous problems; wiring for motors; wiring schools, offices, stores, churches; etc.

HERE is a complete course of instruction for those who want to learn how to do electrical wiring. Begins with very first elements and takes the reader by easy steps, plain instructions and methods, to the completion of typical wiring jobs in accordance with official requirements. Employs simple language; confines mathematics and theory to the minimum necessary for understanding of the work; covers medium voltage jobs of the types that are most in demand.

10 DAYS' EXAMINATION—SEND THIS COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C.

Send me Richter's Practical Electrical Wiring for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

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(Books sent on approval in U. S. and Canada only.)

In the News

[FROM PAGE 53]

A.M.A. DISCUSSES ELECTRICAL MODERNIZATION

Executives in charge of production, plant engineers and plant managers, gathered in Chicago for the 1939 production conference of the American Management Association on November 15-16. Concerned with problems of better use of existing plant facilities, conservative expansion to handle temporarily bloated export markets and the rising domestic market, plant management is critically examining power, light, and wiring facilities in the light of increased production demands.

Analysis of remarks by the speakers and floor discussion indicates the following trends of major importance to electrical contractors;

1. Plant budgets for the immediate future will be devoted to modernization of existing buildings and equipment, rather than extensive new building.

2. Wiring system design will tend toward extreme flexibility, ready maintenance and easy alteration.

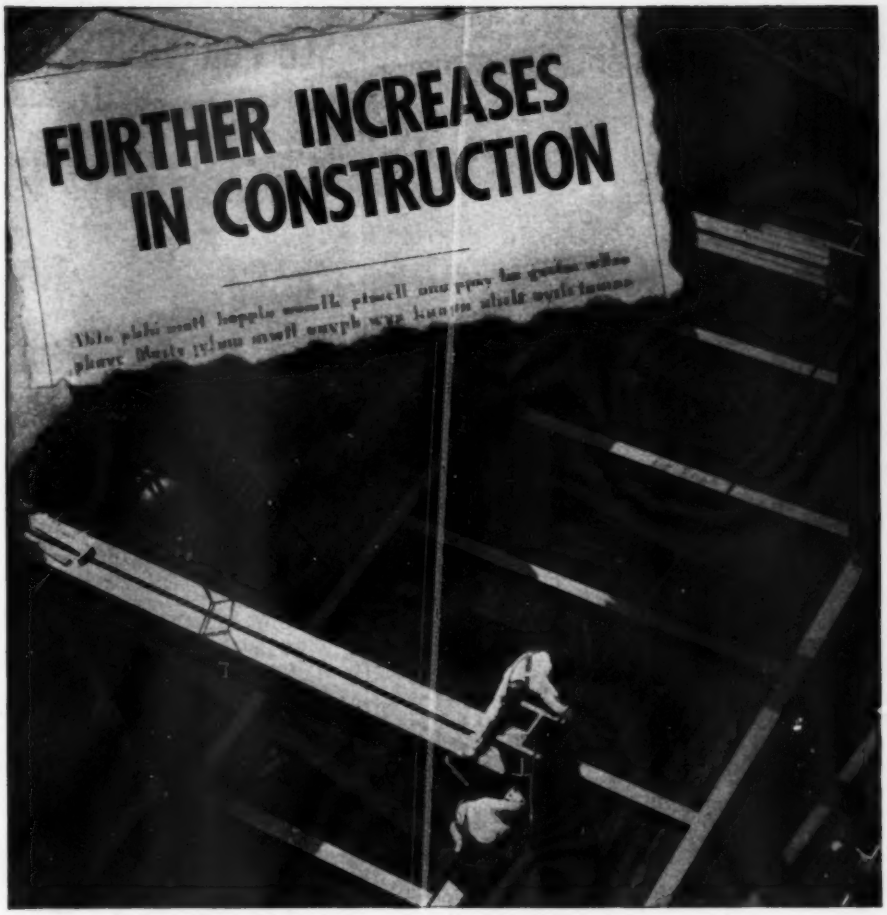
3. Lighting equipment is recognized as a vital production tool, and lighting intensities in general use will be considerably increased.

4. Shift operations are increasing the importance of correct lighting equipment, but there is still no major trend toward windowless buildings entirely dependent upon artificial lighting.

WISCONSIN LAW VETOED

Proposed legislation for the registration of electrical contractors and electricians in the state of Wisconsin was vetoed by

EXCEPTIONALLY COMPLETE *stocks of small motor parts is a feature of the William C. Krauth Electric Co. of Louisville, Ky., motor repair specialists. Boss Wm. C. Krauth takes pride in filling every parts need for his own shop and for customers direct from stock without the annoying delays of factory back-orders.*

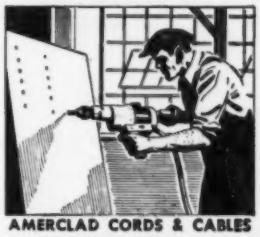


PARKWAY CABLES

VARNISHED CAMBRIC CABLES

AMERBESTOS CABLES

SERVICE ENTRANCE AND DROP CABLES



AMERCLAD CORDS & CABLES

TREE WIRE

. . . *and More Satisfied Users of* AMARINE-*30*

AMARINE-30 building wires and cables with braided coverings are approved by Underwriters' Laboratories for installation underground; in concrete slabs or other masonry in direct contact with earth; in permanently moist locations; and where the condensation and accumulation of moisture within the raceway are likely to occur. Ordinarily, installations of these types would call for the use of lead-sheathed cables. Wherever such conditions exist AMARINE-30 can be employed safely and at worthwhile savings.

Other outstanding building wires of the highest quality are:

Americore (Code)
Amerite (30% Performance)
Amperox (Heat-Resistant)

All of these products are manufactured by the American Steel & Wire Company and are made under rigid supervision. Superior quality and satisfactory service have made them the choice of the building industry. Write for data.

ADEQUATE WIRING SERVES AND SAVES

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

UMI

FIRST IN QUALITY

Out in front leading the quality parade—G-E White Rigid Conduit is sure to please your customers. Years of research have gone into making it a conduit which will last indefinitely in all sorts of conditions. It is made of mild, rimmed steel hot dipped galvanized and Glyptal-coated inside and out. It is easy to work with, easy to bend, and always uniform. Proper boxes and fittings are available.

OTHER QUALITY PRODUCTS

Other G-E Conduit Products are also built according to high quality specifications. The line includes:

- *Flexible Metallic Conduit*
- *Electrical Metallic Tubing*
- *"Fiberduct" Underfloor Raceways*
- *"BX" Armored Cable*
- *BraidX Non-metallic Sheathed Cable*
- *Service Entrance Cable*

All of these materials will give lasting service and are easy to install. Special boxes and fittings are available to use with all of them.

For further information about G-E White Conduit or other G-E Conduit Products, see the nearest G-E Merchandise Distributor or write to Section C-9412, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Connecticut.

GENERAL ELECTRIC

In the News

[FROM PAGE 54]

Governor Heil on the closing day of the legislative session.

It was submitted early in the session and survived several hearings with many amendments. Late in the session, the bill as amended finally passed both houses of the legislature and was submitted to the governor. On the last day of the session the governor returned the bill to the legislature unsigned.

Further action cannot be taken on the bill until the next session of the State Legislature in 1941.

MOTOR DEALERS HOLD SALES CONFERENCE

The Central District Chapter of the National Industrial Service Association comprising motor dealers and motor repair shops in the Chicago area held a sales clinic for motor dealers and their salesmen in Chicago on November 14.

Guest speaker Douglas Doolittle, sales and advertising counsellor, urged more creative selling, less order taking, price cutting and competitive selling. Following his talk the meeting was thrown open to the discussion of individual sales problems.

Most controversial and one of the most important problems discussed was that of specialization versus selling a full line.

The Central District Chapter plans to have future meetings include sales conferences open to salesmen only, shop foremen conferences and a series of educational programs for motor shop operators.

With the Manufacturers

Edison Personnel Changes

The Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, N. J. announces the following changes—

C. B. Archibald, formerly connected with the Railroad Sales Staff in Chicago, has been appointed manager of the St. Louis District, which position was left vacant by the recent death of D. F. O'Donnell.

E. W. Allen, formerly sales engineer at West Orange, has been appointed to the newly created position of manager of engineering.

W. M. Schleicher, formerly Mr. Allen's assistant, has been promoted to the position of sales engineer. W. H. Patterson, chief engineer, continues as head of Factory Engineering.

J. E. Schmidt, formerly superintendent of manufacturing, has been appointed to the newly created position of manager of the Production Department.

SEE FOR YOURSELF

How wires are wedged fast—gripped *completely around* in the V-BOTTOM wire opening of

SOLDERLESS LUGS

Learn how fast you can make strong, neat solderless connections . . . with just your wrench, screw driver or pliers.

SEE ONE IN ACTION!

Write for Free sample—or better still, ask your Electrical Jobber for one.

DEPT. E C

Ilsco Copper Tube & Products, Inc.

5629 Madison Road, Cincinnati, Ohio

No need for this sign *when you have an*

ELECTRICAL BUYERS REFERENCE

Containing complete information on electrical and allied products

Use your copy regularly to save time and money!

ELECTRICAL CONTRACTING
330 West 42nd Street, New York

Paine Representatives

The Paine Company, Chicago has recently increased its national distribution and appointed the following representatives—

Wood and Anderson Company, St. Louis, will cover Southern Illinois, Missouri and part of Iowa. Warner Jones Sales Company, will take care of Cleveland territory. Hamilton Hart takes on Atlanta and H. W. Goetzinger, Pittsburgh.

Harry P. Smith Co. will cover the Minneapolis territory; Robert Feeney of Kansas City, will cover Kansas, Nebraska, Iowa and western part of Missouri; Kack Miner, of Detroit, will take care of Michigan and northern half of Indiana and Herb Kaub, of Denver, will look after Colorado, Montana, Wyoming and New Mexico.

•

Roller-Smith Co., Bethlehem, Pa. has made the following appointments—

J. J. Thalheimer, 242 Fountain Ave., Dayton, Ohio, to be sales agent for Southern Ohio, Southern Indiana and the State of Kentucky.

Walter V. Gearhart Co., Volunteer Building, Atlanta, Ga. to represent them in the states of Georgia, North Carolina, South Carolina and parts of Alabama and Florida.

The Public Service Supply Co., Inc., Midland Bldg., Cleveland, will cover the utilities in Northern and Southeastern Ohio.

•

Allen-Bradley Co. of Milwaukee has appointed Paul Berry factory representative in the states of Oklahoma and Arkansas. His headquarters will be at 3128 N. W. 26th St., Oklahoma City.

In Nebraska and Western Iowa, A. V. Sorensen, operating as the Midwest Equipment Co., 1206 Farnam St., Omaha, will handle the Allen-Bradley line. Mr. Sorensen formerly owned the Midwest Electric Supply Co.

•

Charles G. Pyle was appointed sales manager of **Hygrade Lamp Division, Hygrade Sylvania Corp.** Mr. Pyle fills the vacancy left by the retirement of S. N. Abbott, under whom he served for many years as assistant sales manager. For the time being, he will continue to work from Hygrade's Chicago office, located in the Field Bldg., but he eventually will establish his headquarters at the New York office, 500 Fifth Avenue.

•

Cutler-Hammer, Inc. of Milwaukee announces that Terry Fisher has been appointed to take charge of the Northern Indiana territory, with headquarters in South Bend. He has been with Cutler-Hammer for many years as sales engineer in the Middle West. Clayton P. Innes will represent them in the Omaha territory.

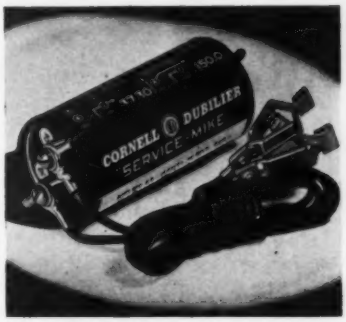
More efficient...more economical!

TAKE ALONG A CORNELL-DUBILIER "SERVICE-MIKE" OR "TEST-MIKE" ON CAPACITOR REPLACEMENT SERVICE CALLS

Save yourself time... complete more service calls each day! Where equipment breakdown is due to defective capacitors, servicing is easy with these convenient Cornell-Dubilier multi-section capacitor units, the "Service-Mike" and "Test-Mike".

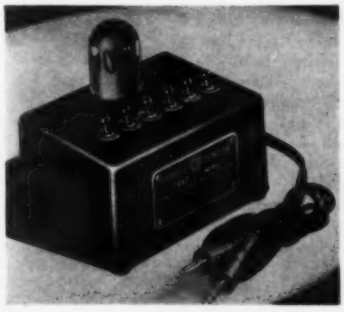
Here, in compact single packages are all the "capacities" you need for emergency repair of practically all existing fractional horse power motors employing motor starting capacitors. For the kind of service that satisfies customers and increases profit for you, you'll want one of these convenient capacity combination test units, with the Dependability Guarantee three decades of capacitor experience insures.

"SERVICE-MIKE"

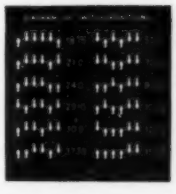


A single A. C. Electrolytic capacitor unit providing a capacity range from 18.75 to 150 mfds. in twelve separate steps. Extremely helpful in determining correct value of capacity required with a given motor where original capacity is unknown. The "Service-Mike" is encased in a hermetically sealed, insulated aluminum container 1 13/16" diameter x 3⅞" long. Terminals are provided with test leads, clips and jumpers for connections. The "Service-Mike" complete with leads, etc., for operation on 110-120 V. A. C. 25-60 cycles net..... $2.25

"TEST MIKE"



The "Test-Mike" contains the same capacitor unit as the "Service-Mike" except that it is furnished in a heavy bakelite case 3½" x 5" x 3", provided with six switches to facilitate selection of any twelve capacity values from 18.75 to 150 mfds. Pilot lamp connected in parallel with leads serves as a visual indicator when voltage is applied to capacitor. With all switches in backward position the pilot light acts as a test on motor switching mechanism.



The "Test-Mike" complete, ready for operation on 110-120 V. A. C. 25-60 cycles net..... $6.00

Use convenient coupon below at your order blank. Send for descriptive catalog No. 168-A on C-D "Test-Mike" and "Service-Mike" free on request.

PRODUCT OF THE WORLD'S LARGEST MANUFACTURER OF CAPACITORS

CORNELL-DUBILIER ELECTRIC CORPORATION
1048 Hamilton Blvd. So. Plainfield, New Jersey

CORNELL-DUBILIER ELECTRIC CORP.
South Plainfield, New Jersey EC-12-39

Rush immediately, C.O.D. ☐ M.O. ☐ check encl. ☐

......"Test-Mike"....."Service-Mike".....
(QUANTITY DESIRED)

☐ Catalog No. 168A on "Service" and "Test-Mikes"
☐ Catalog No. 162A on Industrial Capacitors for Motor Starting and other A. C. applications

Name.....
Address.....
City.....

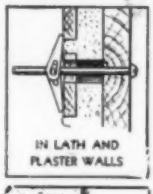
UMI

PAINE

SPRING WING TOGGLE BOLTS

Better Toggle Bolts because: they press through the smallest holes—never catching or jamming on rough, irregular surfaces; open in a minimum space—each jaw works independently, controlled by a spring that snaps it open the instant clearance is made. Permits split-second installations, doing away with adjusting and fussing on the job. To solve any anchorage problem in any hollow material, standardize on Paine Spring Wing Toggle Bolts—foolproof, positive, secure. 18 types in 60 sizes.

Write today for Catalog showing all Paine anchoring devices and metal specialties.



The

PAINE COMPANY

2961 Carroll Ave.
Chicago, Ill.

New York Warehouse & Sales 48 Warren St. Carried by all leading Jobbers.

In the News

[FROM PAGE 57]

General Electric Co. has appointed P. Y. Tumy as manager of its Milwaukee office. He succeeds A. L. Pond, who has retired. Merritt Lawrence has succeeded Mr. Tumy in charge of the Grand Rapids office.

•

Fretz-Moon Tube Co., Inc., Butler, Pa., has appointed A. R. Tayerle as secretary and treasurer. Mr. Tayerle was formerly with Republic Steel Corp.

D. J. Fox resigned as vice president of Fretz-Moon and is now assistant treasurer of National Supply Co.

•

Mello Chime & Signal Co., New York, has doubled its factory space and moved its general offices from 220 West 42d Street, to its plant at 127 West 25th Street, New York.

•

Pittsburgh Reflector Co. has appointed the M. J. Cleary Company, 317 North 11th St., St. Louis as sales representative in the St. Louis area, covering eastern Missouri, the southern section of Illinois, Memphis and all of Arkansas.

•

Copperweld Steel Co., Glassport, Pa., announces the appointment of Frederick J. Griffiths as executive vice-president in charge of the newly-created Alloy Steel Division.

•

Littlefuse, Incorporated of Chicago has enlarged its manufacturing facilities, increased its plant capacity and moved to enlarged quarters at 4757 Ravenswood Ave.

•

R. W. Cramer Company, Inc., Centerbrook, Conn., has appointed Beverly & Ruddock, 7001 N. Clark St., Chicago, to handle its line of Sauter time switches and timers.

•

Kulka Electric Manufacturing Co., Inc., has opened a new plant at 108 East 16th Street, New York.

•

Republic Steel Corporation has appointed C. W. Ruth as director of advertising, taking the place of Stanley A. Knisely. Mr. Knisely is now executive vice-president of Associated Business Papers.

Yale & Towne Manufacturing Co. has announced the promotion of Henry D. Rolph to director of export sales, with headquarters in the Chrysler Building, New York.

•

W. K. Vanderpoel Dies

William Kemp Vanderpoel, vice president of the Okonite Company and the Okonite-Callender Cable Company, died at his home in South Orange, N. J. on October 21.

More Gossip

His Card Sells

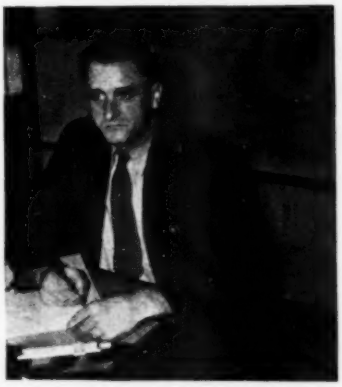
C. P. Molyneux, of the Furst Electric Company of Long Island City, carries two lines on his calling card that do some selling for him. One reads—*"Contractors and Engineers."* That reflects responsibility and skill. The other reads —*"Industrial Surveys."* That starts curiosity.

People ask questions. Out of it come opportunities to check up on wiring systems and make recommendations on equipment. Simple—but smart.

Crystal Shortage

Glass tassels, spangles, and prisms used extensively on electric fixtures, come largely from Bohemia. The war has put a crimp in the supply. The chances are we shall see fewer glass spangles on house fixtures.

Even war has some compensations.



INVENTOR, Walter J. Rider of Binghamton, N. Y., has a motor repair shop which is full of interesting little "gadgets" which he has made himself. These devices cover a wide variety of applications and all are labor saving. "When I need something in a hurry and can't get it, I make it," says Walter, "and it all adds up to better service for my customers."

Poehlmann Heads Wisconsin IAEI

John A. Poehlmann, Milwaukee, was elected chairman of the Wisconsin Chapter of the International Association of Electrical Inspectors at its annual convention at Appleton, October 19 to 21. Mr. Poehlmann succeeds O. B. Rode of Racine.

Other officers elected were vice-chairman, Erwin Pagels, Whitefish Bay; secretary-treasurer, J. E. Wise, Madison; executive committeemen, August Lipske, Menasha; E. C. Knight, Watertown; Fred Luck, Milwaukee; O. B. Rode, Racine.

GRAPPLER H. M. Long, of the L & K Electric Company, Binghamton, N. Y., heads the Council of Electrical Industry of the Binghamton Chamber of Commerce. "Shorty" was captain of the wrestling team in his collegiate days and in his spare moments goes back to his old game and coaches a Boys' Club the gentle art of bone crushing.

Modern Fixture Display

Tops in modern home lighting fixture displays is the showroom of the Fowler Electric Co. in Cedar Rapids, Iowa. There isn't an old timer in the lot, and each fixture is wired up and individually switched, with the wiring system entirely concealed.

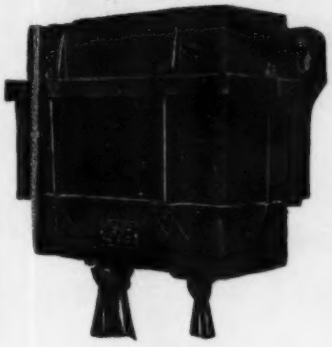
Baltimore Change Over

Baltimore contractors are busy on changeover work for the Consolidated Gas, Electric Light and Power Company. A large part of the business district, including banks, hotels and department stores, is being switched from d.c. to a.c. This work is awarded to the local contractors on a competitive basis.

Face-Lifting With Light

Contracts are underway for beautifying the San Antonio River, at San Antonio, Texas, with light. Several types of light sources and equipment will be used in this extensive program which will include floodlighting and underwater lighting.

FOUR POINT ECONOMY—



Above: Type CFT, three-phase, outdoor-type, air-cooled, general-purpose transformer.

Below: Type CF, Single-phase, outdoor-type, air-cooled, general - purpose transformer.

1 LOW INITIAL INVESTMENT

2 EASY TO INSTALL

3 MINIMUM MAINTENANCE

4 EFFICIENT IN OPERATION

Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

* Units rated 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating, welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.

AMERICAN TRANSFORMER COMPANY

178 Emmet St. Newark, N. J.

PRODUCTS

American Transformer Co. manufactures transformers for every industrial, electronic and laboratory application in sizes up to 10,000 Kva and for potentials up to 132 Kv. Other products: voltage regulators, test sets, rectifiers.

AMERTRAN TRANSFORMERS

Manufactured Since 1901 at Newark, N. J.

EQUIPMENT News

Chime

A new line of chimes designed for large residences, small apartments, bungalows and offices. The one featured here is a dull black shield with a bright brass, full rigged clipper ship, bright brass tubes. Available in two or one entrance models. Overall size is 43½-in. high, 8½-in. wide, 2½-in. deep. If mounting in a recess, five inches should be allowed so screwdriver can be used at top center to remove shield. Edwards and Company, Norwalk, Conn.

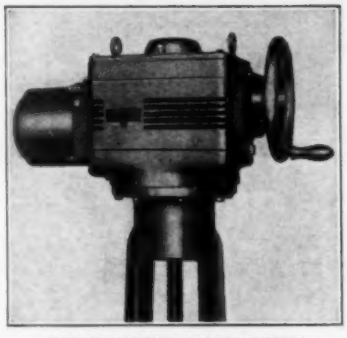
EDWARDS CHIME

■

Multi-Breaker

A new 15-, 20- or 25-ampere multi-breaker developed for use in industrial plants, small home or cottage, and on the farm. Outside dimensions of surface type are 6½-in. high, 4-in. wide and 2¾-in. deep. Unit furnished for two-wire solid neutral 115-volt a.c., one or two single poles, grounded or solid neutral; for three-wire solid neutral 115-230-volt a.c., one double pole or two single poles, grounded or solid neutral; or for two-pole 115-230-volt a.c., one double pole, no neutral. Indicating handle shows whether breaker is on, off or tripped. Available in either surface or flush mounting. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WESTINGHOUSE MULTI-BREAKER



CUTLER-HAMMER VALVE CONTROL

Valve Control

A new valve operating unit designed for use in water pumping, filtration and distribution systems, sewage treatment and disposal plants, oil, air, gas and steam lines. Dust tight, weather proof unit is bolted on top of valve yoke. It consists of thrust springs, high torque, reversible motor, jaw clutch, gear reduction, thrust limit switch controls, and handwheel for manual operation. Available in sizes with a controlling thrust of a few pounds or in larger sizes with a maximum thrust of 400,000 pounds. Cutler-Hammer, Ins., Milwaukee, Wis.

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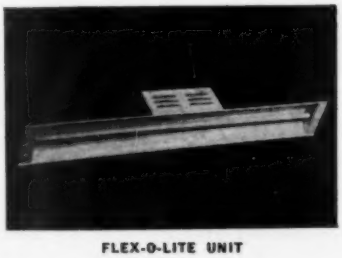
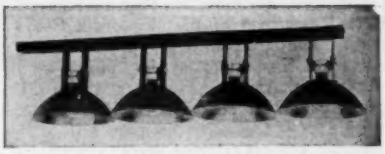


FLEX-O-LITE UNIT

Lighting Unit

The Flex-O-Lite lighting unit is for wide-spread industrial and commercial use, in store windows, displays, plants, warehouses, offices. Available with one or two tubular lamps, 110–200 watts respectively. Reflectors measure 58-in. by 8-in. by 8-in. Power factor 90%; lumens per watt 40; lamp life 5,000 hours. Flex-O-Lite Company, St. Charles, Ill.



FOSTORIA REFLECTOR

Reflector

A gold-plated reflector, known as Para-Sphere, designed for use with infra-red ray lamps. Will accommodate all commercially available infra-red ray lamps, by means of an adjustable porcelain socket. Supplied in single reflector units and in strips of 4, 5, 6 and 7 reflectors. Strips are of two-piece design so that wiring and mounting is done easily. The Fostoria Pressed Steel Corp., Fostoria, Ohio.

■

Electrode

New electrode, known as "Fleetweld 10", designed for finish bead welding on "U" groove welding in downhand position. Provides full slag coverage. Bead is uniform and regular without square shoulders. Can be used with either normal or reverse polarity with d.c. or a.c. Available in two sizes in 18-inch lengths, ⅛-in and 5/32-in. Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio.

■

Time Switch

A new general-purpose automatic time switch for indoor and outdoor use. Known as T-44, it has a streamlined case to make and break 35 amperes of mazda, inductive or resistance loads. Furnished with plain or astronomic dial for turning circuits "on" and "off" at dusk and dawn; for switching two circuits simultaneously "on" and separately "off"; for switching two circuits "on" separately and "off" simultaneously. An omitting device permits skipping "on" operation on selected days of the week. General Electric Co., Schenectady, N. Y.

G.E. TIME SWITCH

LIKE DAYLIGHT

SPEEDS SALES

COOLER

Fleurolier Advertising tells your Customers about *New Fluorescent Light*

SPEEDS SEEING

Fluorescent daylighting has proved to be one of the fastest selling items ever pushed by the electrical contractor!

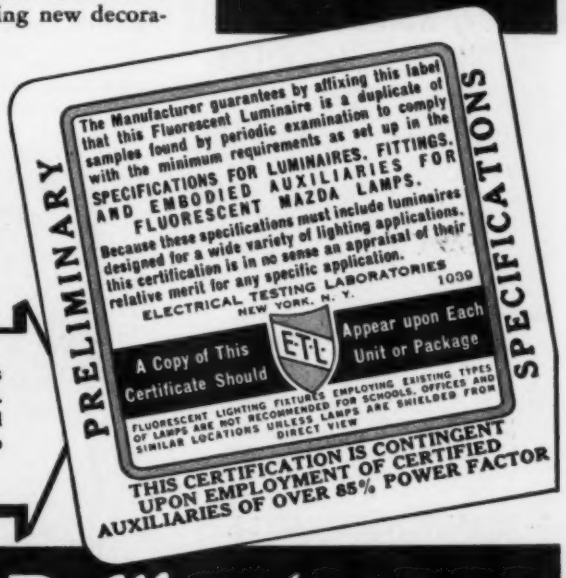
Revolutionary new MAZDA F Lamps, with Certified Fleur-O-Liers, bring new values . . . new high levels of illumination. Fleur-O-Liers are lighting equipment certified to give good performance with these MAZDA F Lamps. With national advertising in commercial and industrial publications, they uncover unlimited sales opportunities for you.

The addition of Daylight MAZDA F Lamps, in CERTIFIED FLEUR-O-LIERS, is a big help to offices, stores and factories—for easier seeing, fine production, fine assembly, close inspection, intricate operation, and color discrimination. Colored MAZDA F Lamps are developing new decorative opportunities in stores, bars, grills, restaurants.

Sell Advertised and Certified Fleur-O-Liers

When you sell Fleur-O-Lier, you know that into its design has gone a wealth of intelligent cooperation for the service of the buyer.

Write today for a list of Fleur-O-Lier Manufacturers and information on types now available. Fleur-O-Lier Manufacturers, 2118 Keith Building, Cleveland, Ohio.


PRELIMINARY SPECIFICATIONS
The Manufacturer guarantees by affixing this label that this Fluorescent Luminaire is a duplicate of samples found by periodic examination to comply with the minimum requirements as set up in the SPECIFICATIONS FOR LUMINAIRES, FITTINGS, AND EMBODIED AUXILIARIES FOR FLUORESCENT MAZDA LAMPS.
Because these specifications must include luminaires designed for a wide variety of lighting applications, this certification is in no sense an appraisal of their relative merit for any specific application.
ELECTRICAL TESTING LABORATORIES
NEW YORK, N. Y. 1039
A Copy of This Certificate Should
E·T·L
Appear upon Each Unit or Package
FLUORESCENT LIGHTING FIXTURES EMPLOYING EXISTING TYPES OF LAMPS ARE NOT RECOMMENDED FOR SCHOOLS, OFFICES AND SIMILAR LOCATIONS UNLESS LAMPS ARE SHIELDED FROM DIRECT VIEW
THIS CERTIFICATION IS CONTINGENT UPON EMPLOYMENT OF CERTIFIED AUXILIARIES OF OVER 85% POWER FACTOR

THIS LABEL signifies a product that complies with specifications set up by the MAZDA Lamp manufacturers. It indicates a product, samples of which have been checked and approved by Electrical Testing Laboratories. **Use it to help you sell.**

FLEUR-O-LIER *Manufacturers*

UMI

MULTI

FLUORESCENT LAMP FIXTURES

New construction and design features, an aid to contractors in meeting new lighting needs

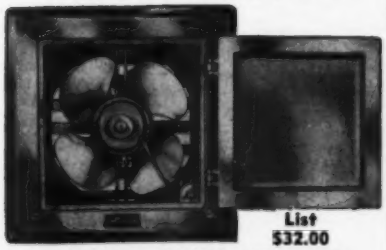
Multi reflectors are your answer because each is especially designed and has special construction features which give best lighting results. Units are of aluminum bronze finish—reflectors of alzac aluminum. Many combinations can be worked out from the basic unit shown. Let us send you construction and installation details.

MULTI

ELECTRICAL MANUFACTURING CO.

1840 W. 14th ST., CHICAGO, ILL.

***Every* HOME A PROSPECT FOR THIS *Vent* FAN**



List $32.00

This deluxe model SIGNAL Kitchen Vent Fan is a popular all year 'round seller—and a profitable one too. Has a capacity of 740 C.F.M. in free air. It is adjustable to the wall thickness of new and old homes. Inside and outside polished cast aluminum frames, enclosed motor, large oil reservoirs, polished quiet 10" fan blade are big selling features. The outside shutter and motor switch operate automatically by the opening and closing of the door. Ask your jobber to show it to you now.

SIGNAL ELECTRIC MFG. CO.

MENOMINEE, MICHIGAN

Offices in All Principal Cities

SIGNAL

EQUIPMENT *News*

[FROM PAGE 60]

Lighting Fixture

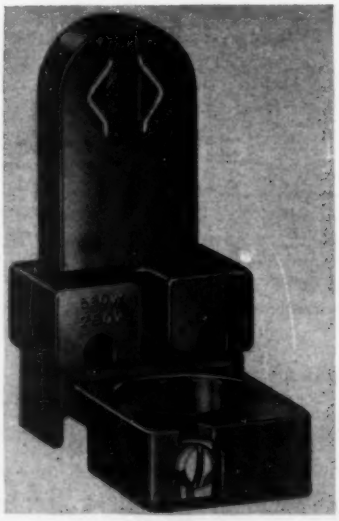
The "Protecto" diffuser, developed for illuminating areas where precision operations require continuous good vision. It uses a deep-skirted reflector and smaller size globe, which is concealed high above the bottom of the reflector skirt. Available with Diskonnect hood permitting release of reflector, globe and lamp as a complete unit. Diffuser is for pendant or outlet box mounting. Goodrich Electric Co., 2900 N. Oakley Ave., Chicago, Ill.

GOODRICH PROTECTO DIFFUSER

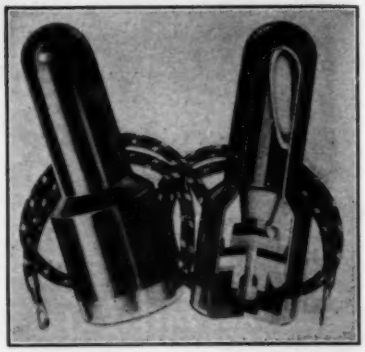
■

Fluorescent Lamp Starter

A new replaceable switch and condenser unit for wiring and mounting fluorescent lamps. The switch and condenser, which form the starter, are enclosed in a small aluminum container fitted with contacts. A new lampholder has been designed for use with the starter. When mounted in lampholder, starter projects through reflector of channel surface immediately below the lamp. Auxiliaries, available in various sizes, must also be used. General Electric Co., Bridgeport, Conn.



G. E. LAMP STARTER



DURAKOOL MERCURY SWITCH

Mercury Switch

An improved mercury switch suitable in maintenance contact problems, from wall switching to motor starting. Two reducing agents prevent deterioration of mercury, eliminate possibility of contact interruptions, assure efficiency and reliability in operation. Available up to 200 amp. They are unbreakable, non-inflammable and withstand temporary short circuits. Durakool, Inc., 1010 North Main St., Elkhart, Ind.

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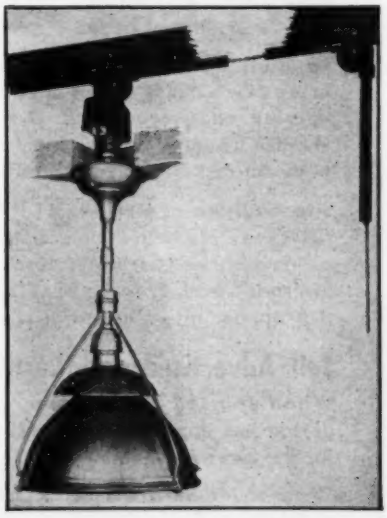


THOMPSON LOWERING HANGER

Lowering Hanger

A new concealed mounting of the Thompson Lowering hanger is adapted to public buildings, churches, banks, department stores and other types of construction where high-positioned ornamental lighting fixtures are used. It is recessed in ceiling in a 7-in. diameter opening, spring mounted spun steel canopy is attached between hanger and lighting fixture and conceals hanger when fixture is latched in operating position. Operating chain, for disconnecting and lowering fixture, may be concealed in conduit in wall or column and terminate in a flush mounted wall cabinet. The Thompson Electric Co., 1101 Power Avenue., Cleveland, Ohio.

UMI

Circuit Breaker

A fully electro magnetic, non-thermal auxiliary circuit breaker in Crouse Hinds explosion proof housings. For 110-volt and 220-volt, a.c., it is supplied in horse power ratings up to 1 h.p. and up to 35 amperes. Recommended for application in all hazardous locations, such as paint factories, mines, refineries, chemical laboratories, graineries, distilleries, arsenals or where acids, gases or dust are prevalent in atmosphere. Breaker has magnetic instantaneous trip on short circuits and magnetic time delay on harmless overloads. Heinemann Circuit Breaker Co., Trenton, N. J.

HEINEMANN CIRCUIT BREAKER

Direct Drive Undercutter

Direct drive undercutter is for field or shop use where motor or brush rigging is not removed. It is a complete unit with motor and undercutting mechanism cased in aluminum castings. Has anti-friction bearings, adjustable depth gauge and roller guide. Slots may be cut to within ⅛-inch of commutator riser. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Ill.

IDEAL UNDERCUTTER

ARROW-HART & HEGEMAN WALL PLATE

Wall Plate

Thermometer wall plate No. 9020 for standard flush tumbler switches. Has an accurate thermometer recessed at left side to show room temperature at each switch. Indications are shown in etched metal supporting thermometer tube and red liquid gives reading of room temperature. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

Lighting Unit

Plastic Downlight No. 379L accommodates lamps from 200 to 500 watts. Has a 19-inch plastic reflector and a new type louver for downlighting. Louver is of new radial design for wide distribution over counter areas. A small unit with an adapter socket is available for use with 200 to 300 watt lamps. F. W. Wakefield Brass Co., Vermilion, Ohio.

WAKEFIELD DOWNLIGHT

Lighting Units

These new luminaires are for general or supplementary lighting of gasoline pump islands, safety islands, parking and housing areas, play areas, loading platforms, parks, drives. Available in either bipost or screwbase styles. All units use one-piece reflectors with bead turned inward and without openings in upper sections. Housing for screwbase units consists of aluminum cap which fits around lamp neck and slips over fitter casting to exclude bugs, dirt and excessive moisture. For bipost lamps there is a cast-iron hub, finished with metallic aluminum paint, with cadmium plated support rods and cap nuts. Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

WESTINGHOUSE LUMINAIRE

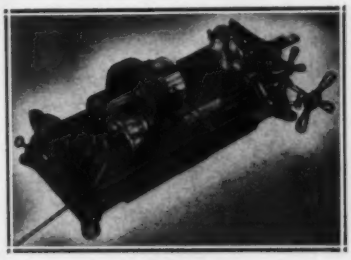
The A-B-C of . . .

Pipe Machines!

Model-A

A high-speed heavy-duty deluxe Pipe and Bolt Machine. Range ⅛ to 2-inch-up to 12-inch with geared tools and drive shaft. Bolts, ¼ to 2-inch. Wt. 415 lbs.

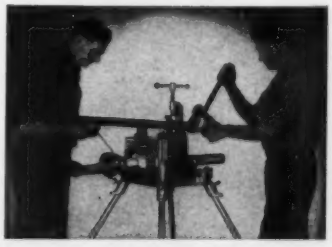
From $309.50 up
Write for Bulletin A



Model-B

Big Brother to Model-C Power Unit. A light-weight utility Pipe and Bolt Machine combining many features of Model-A with the easy portability of Model-C. Range ⅛ to 2-inch-up to 8-inch with drive shaft and geared tools. Bolts up to 1½-inch. Weight 240 lbs.

From $217.50 up
Write for Bulletin B



Model-C

A sturdy little Power Unit Converts hand pipe tools into power tools from ⅛ to 8-inch. Threads 8-inch in 6 minutes. Threads bolts up to 1½-inch. Two men can work at the same time without interference. Weight 150 lbs.

From $127.50 up
Write for Bulletin C

BEAVER PIPE TOOLS

1239 Deen Ave. Warren, O.

PROCESS TIMERS

INTERVAL TIMERS, or PROCESS TIMERS, are furnished in two types. One is reset by hand (manually); other resets itself, automatically. Both types can be provided for practically any cycle of time, fully adjustable from zero to maximum period. SYNCHRONOUS, SELF-STARTING MOTORS.

SIGNAL TIMERS

Used extensively for starting and stopping industrial work; school class periods; for municipal time signals, etc. Up to six signal periods, permanently set at factory with Sunday & Holiday Cutout and Manual Control, at a list price of only $35.

TIME SWITCHES

TRIPLE POLE
DOUBLE POLE
SINGLE POLE

All three types can be furnished with capacities ranging from 20 TO 200 AMPERES PER POLE, listing from $16.50 up. Ten ampere Time Switches from $3.95 up.

Write for Information

AUTOMATIC ELECTRIC MFG. CO.

MANKATO, MINNESOTA

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

Cadmium and Everdur
MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

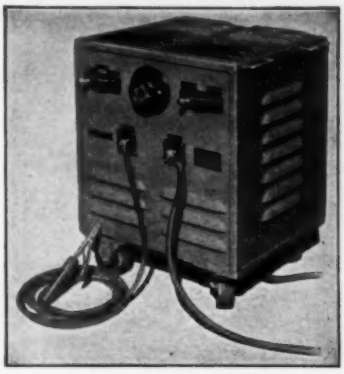
MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

EQUIPMENT NEWS

[FROM PAGE 63]

Arc Welder

A new low-current electronic arc welder, called Weld-O-Tron, can be used to weld with currents as low as 5 amperes, using 1/32-in. and 3/64-in. electrodes. It welds steels, stainless steels and other metals lighter than 18 gauge. Controls and terminals are dead front type and located on control panel. For use on a.c. and d.c. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

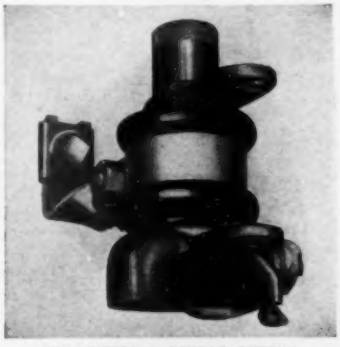


ALLIS-CHALMERS WELD-O-TRON

■

Low Voltage Cutout

A new low voltage cutout rated at 250 volts, 100 amperes, with interrupting capacity of 5000 r.m.s. amperes. It is for use on low voltage distribution systems to prevent transformer failures, to isolate faulty sections in an inter-connected or "banked" system of secondaries and to protect against overfusing and provide convenient means for disconnection in customers' service. Can be fused with standard primary distribution fuse links having button heads, or with links made for secondary service carrying a button head. Various types of mountings are available. Schweitzer & Conrad, Inc., 4435 Ravenswood Ave., Chicago, Ill.



SCHWEITZER & CONRAD CUTOUT

BENJAMIN "STREAM-LITER" REFLECTOR

Twin Lamp Fluorescent Fixture

A porcelain enameled single-reflector type twin-lamp unit for the new 48-inch lamps designed to make available the advantages of fluorescent lighting. Units have wide spread distribution of light comparable to dome-type incandescent lamp reflectors. Fixture utilizes a single large-area closed end reflector common to both lamps. Lamps, sockets, thermal-glow switch and line ballast equipment are attached to reflector which is hinged to the upper housing for ease in wiring and accessibility. "Tulamp" type ballast units, which incorporate a capacitor in one lamp circuit to bring power factor to approximate unity are used in these fixtures. Benjamin Electric Manufacturing Co., Des Plaines, Ill.

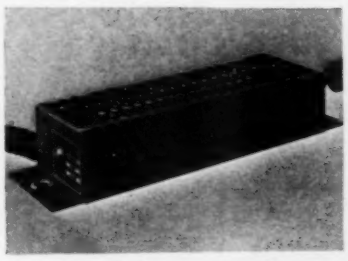
■

Lighting Equipment

A new line of show case lighting equipment designed for use with fluorescent daylight and natural or colored lamps. Adaptable also for use with lumiline lamps. Recommended for a wide variety of applications where fixture and reflector units of small cross section are needed in large and small stores. The Wiremold Company, Hartford, Conn.

WIREMOLD LIGHTING EQUIPMENT

■



WARD LEONARD RESISTOR

Resistor

A Vitrohm resistor for operation of fluorescent lamps on direct current. Units are mounted in a small perforated metal case. Long flexible leads facilitate connecting units, when mounted in any standard fixture, wiring trough or channel. Available for 15, 20, 30 and 40 watts. Plug-in type for portable use is also available for 15 and 20 watt lamps. Ward Leonard Electric Co., Mount Vernon, N. Y.

Lighting Unit

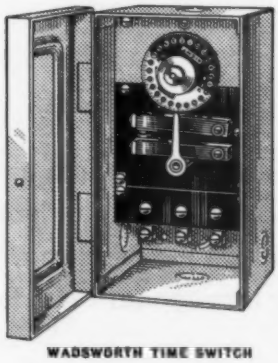
A lighting unit designed for conditions found in heavy industries. It is called "Steelite" and is armorclad with a steel housing above and "Herculite" heat, cold and impact resistant glass below. It is dust tight and vapor proof. Glass cover is unaffected by extreme temperature changes. Glass is sealed into a special-formula, non-hardening gasket, which seats against reflector housing. Hinged cover frame is locked to housing by six thumb-operated compression-latches. Two types of Alzak aluminum reflectors are available, one for high mounting installations and the other medium mounting heights. Units take lamps from 750- to 1500-watts. Benjamin Electric Mfg. Co., Des Plaines, Ill.

BENJAMIN LIGHTING UNIT

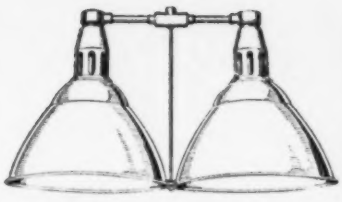
■

Time Switch

These electric time switches are for automatically controlling electrical circuits for commercial, domestic, poultry farm and industrial use. Knockout in top, bottom, back and sides. Has synchronous motor, self-starting, sealed in lubrication. Quick make and quick break switch action, operated by motor driven clock movement produces a "wipeaction" before contact is broken. Terminal block equipped with solderless lugs. Wadsworth Electric Mfg. Co., Inc., Covington, Ky.



WADSWORTH TIME SWITCH



MILLER REFLECTOR

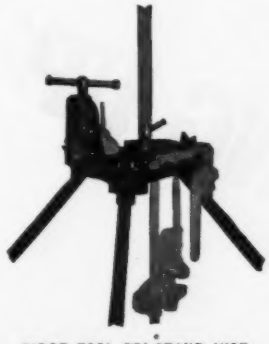
Reflector

An Ivanhoe Tulamp high bay reflector assembly for 400 watt mercury lamp. Consists of two reflectors on a condulet hanger arranged so that they can be handled as a single unit and operated from a single outlet with a Tulamp transformer. Has short runs of ½-in. conduit extending out each side horizontally to condulet outlet boxes. Reflectors made of No. 16 gauge aluminum with Alzak finish. Recommended for lighting of high bay areas, 40 feet and more, and where it is desirable to use combination Mercury-Mazda lighting to obtain color correction. The Miller Co., Meriden, Conn.

■

Pipe Vise

A new pipe vise complete with three legged stand. Legs are hinged at tray, fold together and fasten with chain for handling and carrying. Legs equipped for screwing to plank or floor. Complete with a pipe rest and three sizes of pipe benders. Equipped with adjustable screw for ceiling brace to hold vise rigid while in use. Tri-Stand vises are available in 2½-in. yoke and 4-in. chain patterns. Ridge Tool Company, Elyria, Ohio.



RIDGE TOOL TRI-STAND VISE

■

Industrial Lamps

White-bowl lamps for operation in any position, designed for industrial use in RLM direct-lighting reflectors. Available in sizes ranging from 150 to 1500 watts. A new formula for bulb coating eliminates premature blackening. Coating the bowl reduces brightness of that part of lamp and prevents glare. Westinghouse Electric & Manufacturing Co., Bloomfield, N. J.

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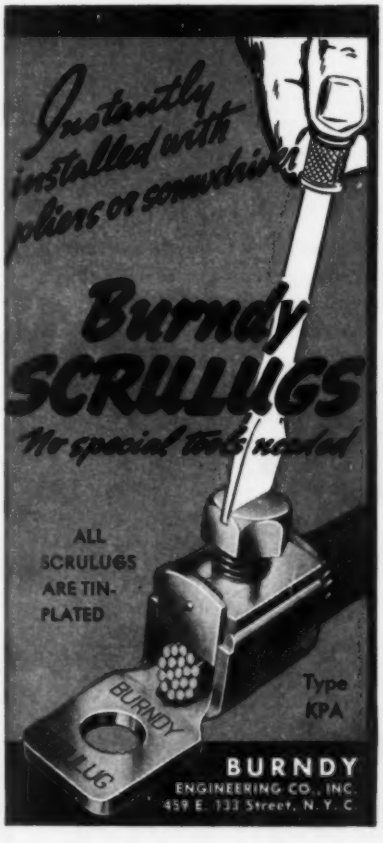

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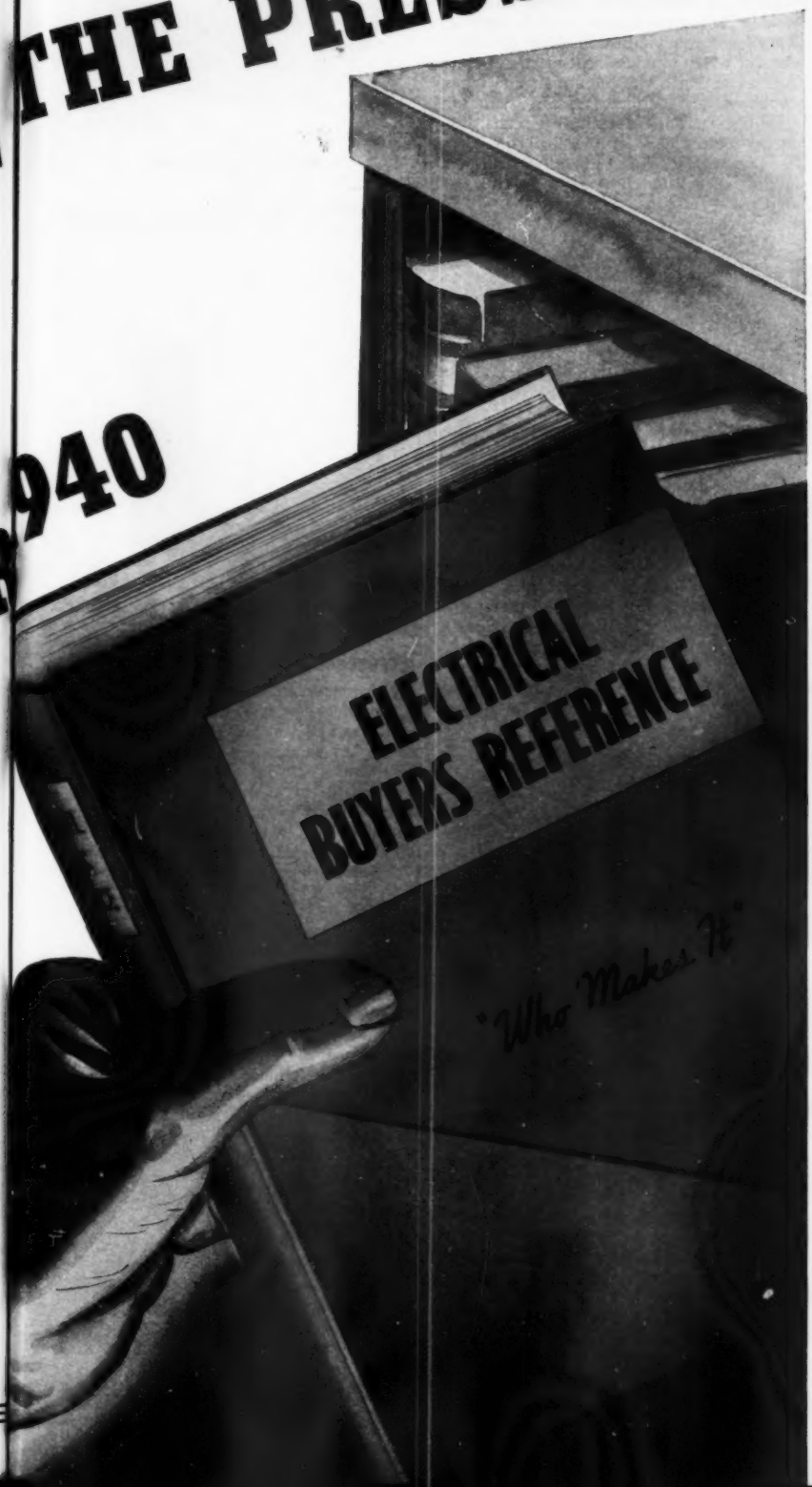

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Hundreds of letters like these, from buyers of Electrical products, say...

Use It Right Along —"We have occasions to use it right along," says a Lighting Manufacturer in Illinois.

"It's of considerable help to us from time to time," writes the Sales Engineer of an Insulated Wire and Cable Co. in Mass.

Useful in Locating Special Products —"This book will be of much use to us, particularly in finding manufacturers of special and infrequently used material and apparatus," writes a Gas & Electric Company in Vermont.

Every Buyer Should Have It —"We certainly believe it is a reference book that every buyer should have in his possession," writes the Chief Electrician of a Stoker Company in Erie, Penna.

Of Great Assistance—"We make use of this book right along in our run of work, and find it of great assistance," writes Power & Light Company user from Penna.

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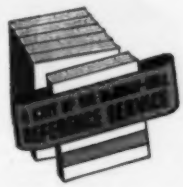
Invaluable Aid to Business —"Cannot conceive of an electrical wholesale house without this book in its catalog rack. This book is an invaluable aid to our business and upon receipt I put index tabs on pages in view of the numerous times we use it"— from a wholesale supply house in York, Penna.



Electrical
Buyers Reference

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330 W. 42nd ST., NEW YORK, N. Y.

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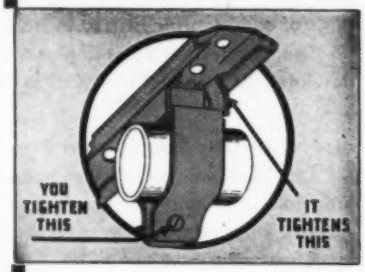
With Only One Screw to Tighten. . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker Easier Installation

"CONVINCE YOURSELF"

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THE CLEVELAND SWITCHBOARD CO.

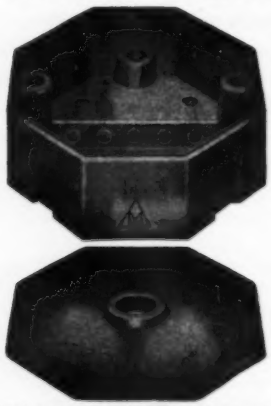
2927 E. 79 St. Cleveland, Ohio

Profit by USING

ILLINOIS

Dependable Porcelain

OUTLET BOXES



+ Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.

MACOMB, ILL.

EQUIPMENT News

[FROM PAGE 45]

Fuses

"Slo-Blo" fuses were designed to carry inductive or capacitative surges and overloads for a reasonable period of time and to blow before the danger point is reached. They have a simple fuse link and a resistor element which provides heat inertia or time lag. A spring opens the circuit and takes up expansion. Protects motors, vibrator circuits, intermittent control circuits, inductive power packs. Fuse is 1¼-in. long by ¼-in. dia. Nine ratings are offered in the range between 1 ampere and 1/100 ampere. Littelfuse Incorporated, 4757 Ravenswood Ave., Chicago, Ill.

LITTELFUSE "SLO-BLO" FUSE

■

Indication Lamp

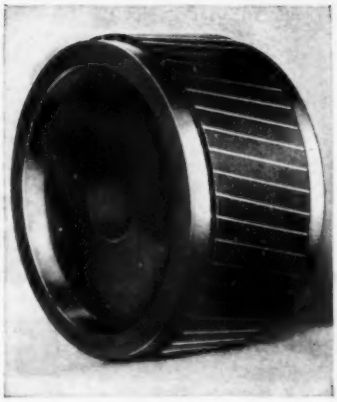
This recessed-lamp receptacle reduces lamp theft and breakage. Uses standard S14 lamp, tungsten or neon, 2 to 10 watts. Can be mounted on standard box or in a single hole on a panel. Lamp extends outward one-third less, converting lamp tip into a convex lens. Some of the applications are exit light, elevator signal, overdoor signal, fire shaft light, equipment marker light. Furnished on round or multiple-gang plates. H. R. Kirkland Co., Morristown, N. J.

KIRKLAND INDICATION LAMP

■

Copperspun Rotor

A new one-piece centrifugally cast copperspun rotor, adapted to severe service such as plugging or reversing duty. Rotor bars and end rings are formed in one piece by pouring molten copper into a mold that encases punched laminations, stacked and held under pressure. One-piece steel fans are welded to rotor core for open type motors; fans for splash-proof motors are shaft mounted. Some of the features are—a copper rotor winding with high electrical conductivity and low thermal expansion; machine-finished rotor surfaces; high melting point of rotor winding and dynamic balance. Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago, Ill.



F. M. COPPERSPUN ROTOR

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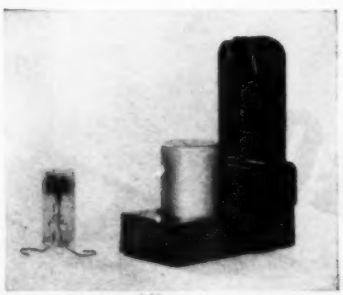


WESTINGHOUSE LAMP BALLAST

Fluorescent Lamp Auxiliary

A new fluorescent lamp starter and current-limiting device. Starter is located in special socket attached to standard fluorescent lampholder by a single screw. Ballasts available for single and two-lamp operation. Heart of starter is glow switch. Glow tube and capacitor are housed in an aluminum shell with bayonet end and fit into starter socket. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

■

Wire Rope Clamp

The "Safe-Line" wire rope clamp is of streamline design, with double holding power, ease of assembly and safety for employees. The inner surface which grips the wire rope, is double spiral splined to fit each strand and wire of rope. Gripping halves of clamp are held tightly to rope by taper threaded nuts. Sizes are for ropes ½-in. to ¾-in. National Production Co., 4561 St. Jean Ave., Detroit, Mich.

NATIONAL "SAFE-LINE" CLAMP

Switch

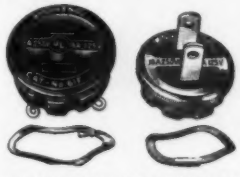
A new line of standard switches with Textolite boxes has been developed, having "T" rating for Type C loads. Blades are anchored in Textolite blade carriers. Contacts are positioned by holes molded in the Textolite base. Dust cover, assembled under supports, and compression-type spring is used. Large binding screws for top wiring accommodate No. 12 wire. Single-pole, double-pole, three-way and four-way types are available. General Electric Co., Bridgeport, Conn.

G-E TEXTOLITE SWITCH BOX

■

Receptacles and Plugs

A new line of receptacles and plugs molded from high dielectric bakelite. Construction provides a new method of mounting for high speed productions. Contacts are phosphor bronze. Equipped with solder lugs. Available for direct mounting, with several types of mounting plates for screws or rivets; also, above or below surface mounting, and metal caps for use as cable connectors. American Phenolic Corp., 1250 Van Buren St., Chicago, Ill.

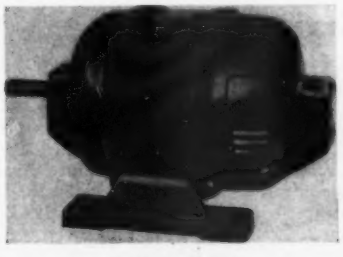


AMERICAN RECEPTACLES AND PLUGS

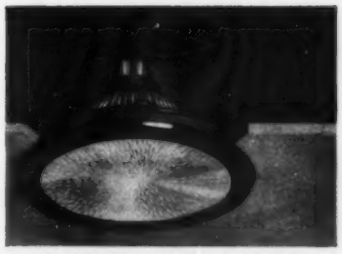
■

Single Phase Motors

A new line of single phase motors is now available in the commonly used types and ratings. Included are type "BSF" repulsion-induction motors of "buried squirrel cage" construction, in sizes from ¾ to 3 hp. incl., 110/220 volts; type "BS" repulsion start-induction run motors from ½ to 1 hp. incl., and connected 110/220 volts; capacitor motors for industrial requirements. Available in standard, open, enclosed, explosion proof, fan cooled, flange mount and vertical types, also built-in gears and electric brakes. Sterling Electric Motors, Inc., Los Angeles, Calif.



STERLING MOTOR



HOLOPHANE INBILT CONTROLEN

Lighting Unit

Inbilt Controlens R-1894 is of new "No-Box" construction, eliminating metal housing. Round flush controlens is combined with prismatic reflector. Recommended for commercial interiors, it uses a 200- or 300-watt lamp. Easy to install and clean. Dimensions are face plate 15¼-in.; plaster opening 15-in. and recessing depth 12¼-in. Holophane Company, 342 Madison Avenue, New York.

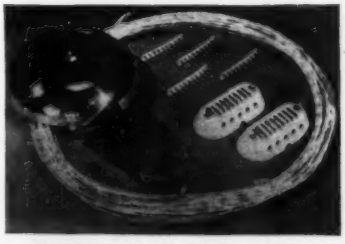
■

WIREMOLD MIDGET PLUGMOLD

Midget Plugmold

The midget Plugmold, a multi-outlet wiring system, designed for small home and apartment use. New line is available with complete assortment of fittings, and receptacles in standard or ivory finish. Smaller in size, it fits above standard baseboard and embodies the same principles as the Plugmold system. The Wiremold Company, Hartford, Conn.

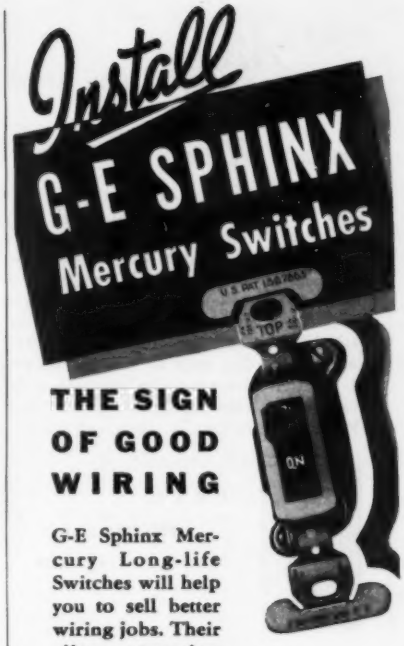
■



TECHNICAL APPLIANCE FYRE-SCOUT

Fire-Detection System

Fyre-Scout is a fire-detection system for use in household, shop, farm or factory. Thermostatic switch enclosed in a housing, closes circuit and keeps it closed when a dangerous temperature is reached in its vicinity. All detector heads are wired in parallel and connected between fire gong and power source, which may be a 6-volt dry battery or bellringing transformer. Unit consists of gong, two detector heads and 75 feet of heavy-duty twisted-pair wire. Technical Appliance Corp., 17 E. 16th St., New York City.



THE SIGN OF GOOD WIRING

G-E Sphinx Mercury Long-life Switches will help you to sell better wiring jobs. Their silent operation interests people. And with this opening it is easy to explain the advantages of these modern switches and of other modern wiring materials and methods.

The G-E "Sphinx" line is complete with single-pole, double-pole, three-way and four-way switches that can be installed in any standard switch box. Ratings: 5 amp., 250 volts; 5 amp., 125 volts, T (T rating on 125 volts only) A-C, or D-C. Listed as follows:

CATALOG NUMBER	DESCRIPTION
GE3008	Single-pole Brown Handle
GE3009	Double-pole Brown Handle
GE3010	Three-way Brown Handle
GE3011	Four-way Brown Handle
GE3088	Single-pole Ivory Handle
GE3089	Double-pole Ivory Handle
GE3090	Three-way Ivory Handle
GE3091	Four-way Ivory Handle

For further information about these switches — that have no springs to break or blades to hammer away — see the nearest G-E Merchandise Distributor or mail coupon below.

GENERAL ELECTRIC COMPANY
Section D-9412
Appliance and Merchandise Department
Bridgeport, Connecticut

Sirs: Please send me full information about G-E Sphinx Mercury Switches.

Name .....

Address .....

City ..... State .....

GENERAL ELECTRIC

UMI

EQUIPMENT NEWS

[FROM PAGE 69]

Receptacle and Pilot

For 3-wire systems, this one gang unit of 3-wire plug outlet and red jewel pilot light shows at a glance when current is being consumed through an outlet. Now available for all conditions requiring a third wire for ground connections or polarized circuits. Unit is complete with .060-in. brush brass plate and ruby jewel. Receptacle and plate may be ordered separately so that plates may be attached after interior finish is completed. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

A. H. & H. RECEPTACLE AND PILOT

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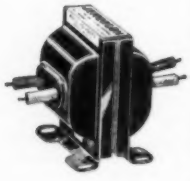


JEFFERSON CHIME TRANSFORMERS

Chime Transformers

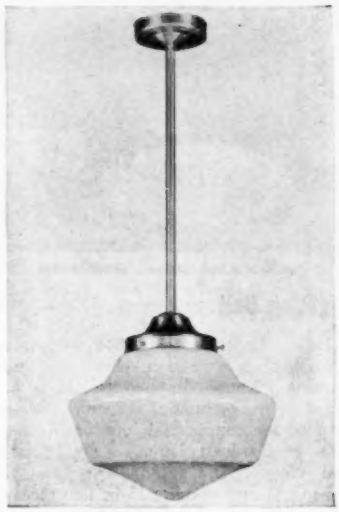
A new series of chime transformers, with 12-volt and 18-volt secondaries for connection to 115-volt circuits. Types are furnished with secondary lead wires or binding posts. The intermittent duty rating is 15 volt ampere. Furnished with standard mounting feet or mounted on round or square outlet box covers. Jefferson Electric Co., Bellwood, Ill.

■

Compressor

A new line of industrial compressors and vacuum pumps in sizes of from ½ through 5 hp. They embody "Finger Valve" construction, form only one part of complete range of Type 30 compressors, which are built in sizes up to 15 hp. for pressures as high as 1000 pounds. Available with or without drive, receiver-mounted or bare. Ingersoll-Rand Co., Phillipsburg, N. J.

INGERSOLL-RAND COMPRESSOR



WESTINGHOUSE LIGHTING UNITS

Direct Lighting

New direct lighting units for general commercial purpose. Enclosing globes are diffusing, single layer, homogeneous glass comforming to standard specifications of the I.E.S. Reinforced fitter edges eliminate sharp edges and minute fissures which vibration might develop into destructive cracks. Ceiling and semi-rigid suspension hangers available in both safety holder and screw holder types. All casing and fittings are of sufficient size for free introduction of wires without abrasion of insulation. Units meet specifications of governmental agencies and are approved by National Board of Fire Underwriters. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

■

BEACON RECTIFYING SET

Rectifying Set

This rectifying set is designed to operate any low voltage signaling system from mains supplying a.c. Adapted for telephones, bells, annunciators, alarms. By means of a transformer, copper oxide rectifier and filtering devices, current is converted to a smooth, unidirectional current of any required voltage and current capacity. Operates without any liquids or moving parts. Beacon Rectifier Co., Hyde Park, Mass.

Fluorescent Lampholder

A new "Straight Push" fluorescent lamp holder, No. 4302, is now available which eliminates twisting the lamp to make contact. Lamp may be inserted by a straight push and removed by a side push on the lamp. Furnished in black or white bakelite with standard mounting dimensions. Can be used for flush or surface mounting. The Bryant Electric Co., Bridgeport, Conn.

BRYANT FLUORESCENT LAMPHOLDER

■

TRUMBULL MAGNETIC STARTER

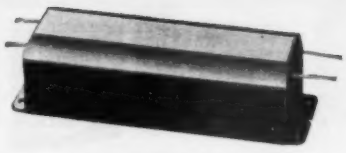
Magnetic Starter

Type "M-2" Size O magnetic starter is applicable for machine tool and allied industries, requiring starters for fractional hp. motors and motors up to 2 hp. providing under-voltage protection and electrically interlocked with other starters. It consists of a 3- or 4-pole contactor with two hand or automatic reset isothermic temperature overload relays mounted on contactor frame and enclosed in case. One pole of contactor is used as a holding interlock and extra interlocks can be added if required. Some of the features are convenience in wiring, easy maintenance, shock-proof, moisture resistant, trouble-free service, tamper-proof. Trumbull Electric Mfg. Co., Plainville, Conn.

■

Fluorescent Ballast

A new design of ballast for use with fluorescent mazda lamps. The lamp starter or switch has been removed from the older type of ballast, permitting it to be mounted in another part of the circuit and making it accessible from outside of fixture. Available in ratings of 15- and 20-watts, 110–125 volts; 30- and 40-watts, 110–125, 199–216, and 220–250 volts, 50 and 60 cycles. Advantages are—an economical single unit to



G-E FLUORESCENT BALLAST

operate two lamps, a self-contained capacitor for power-factor improvement, better voltage regulation and a separately mounted starter. Also a ballast for use with fluorescent lamps operated from d.c. circuits is available. These d.c. ballasts must be operated with externally mounted resistors. General Electric Co., Schenectady, N. Y.

■

Automatic Timer

Interval timers with automatic reset furnished for practically any desired maximum length of time or cycle. All built to adjustment for individual need, but are similar enough for mass production. By turning indicator hand to any desired point on the dial, an operator starts the timing motor automatically, and on reaching point 0, circuit will be opened or closed. Used to signal end of set interval by bell buzzer or light. Units continue signal till shut off or for specified interval and then shut off automatically. Timers equipped with synchronous self starting motors with capacity 10 amp. a.c. Automatic Electric Manufacturing Co., Mankato, Minn.

AUTOMATIC INTERVAL TIMER

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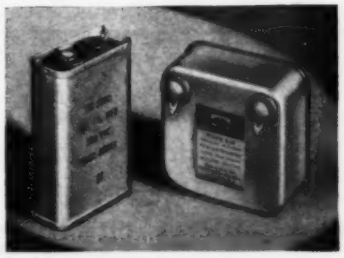

CORNELL-DUBILIER CONDENSER

Capacitors

A series of a.c. motor starting capacitors, Type KG, is for operation under any conditions of temperature and humidity. Each unit is hermetically sealed in a non-corrosive container. Standard Type KG units are available in capacities from 1 to 50 mfd. and rated at 300 volts, 60 cycle. Other KG units in 440 and 600 volt ratings and in cylindrical form instead of rectangular. Cornell-Dubilier Electric Corp., South Plainfield, N. J.

■

HARNISCHFEGER WELDER

Welder

A new 200-ampere welder that can be hooked up in parallel for any desired capacity. These square-framed welders occupy 3½ sq. ft. of floor space and give a welding range from 40 to 225 amperes. Where a wider range is desired, they may be mounted one on the other and hooked in parallel. May be used singly or in parallel, connected or disconnected at will by means of a paralleling switch mounted on unit at bottom. When used in parallel two units are controlled automatically in one operation by the "Multiple Shifter". Harnischfeger Corporation, Milwaukee, Wis.

■

Selenium Rectifier

A new line of industrial rectifiers called Type SR series. Selenium plates form the rectifying medium in this rectifier, which operates on a principle similar to other types of dry plate rectifiers. Fewer and smaller plates are required for a given voltage-current output in selenium rectifiers, it is claimed. Efficiency is affected very little by temperature. Will withstand overloads as high as 75 per cent for several hours without deterioration. Rectifier elements, transformer, fuses and controls are mounted in ventilated steel cabinets. Standard types are furnished with d.c. voltmeter and ammeter, but other meters can be included to specification. Fansteel Metallurgical Corp., North Chicago, Ill.

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- *Square-End*
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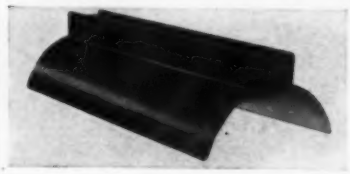
NOW MADE FOR TULAMP BALLASTS



These Tulamp Ballasts will operate Two Lamps, with separate starting switch, at high power factor and with less flicker.

Made in two Types for 36" and 48" lamps

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Model Tulamp—48—$15.50 List

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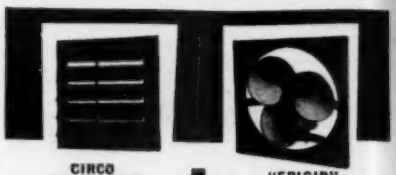

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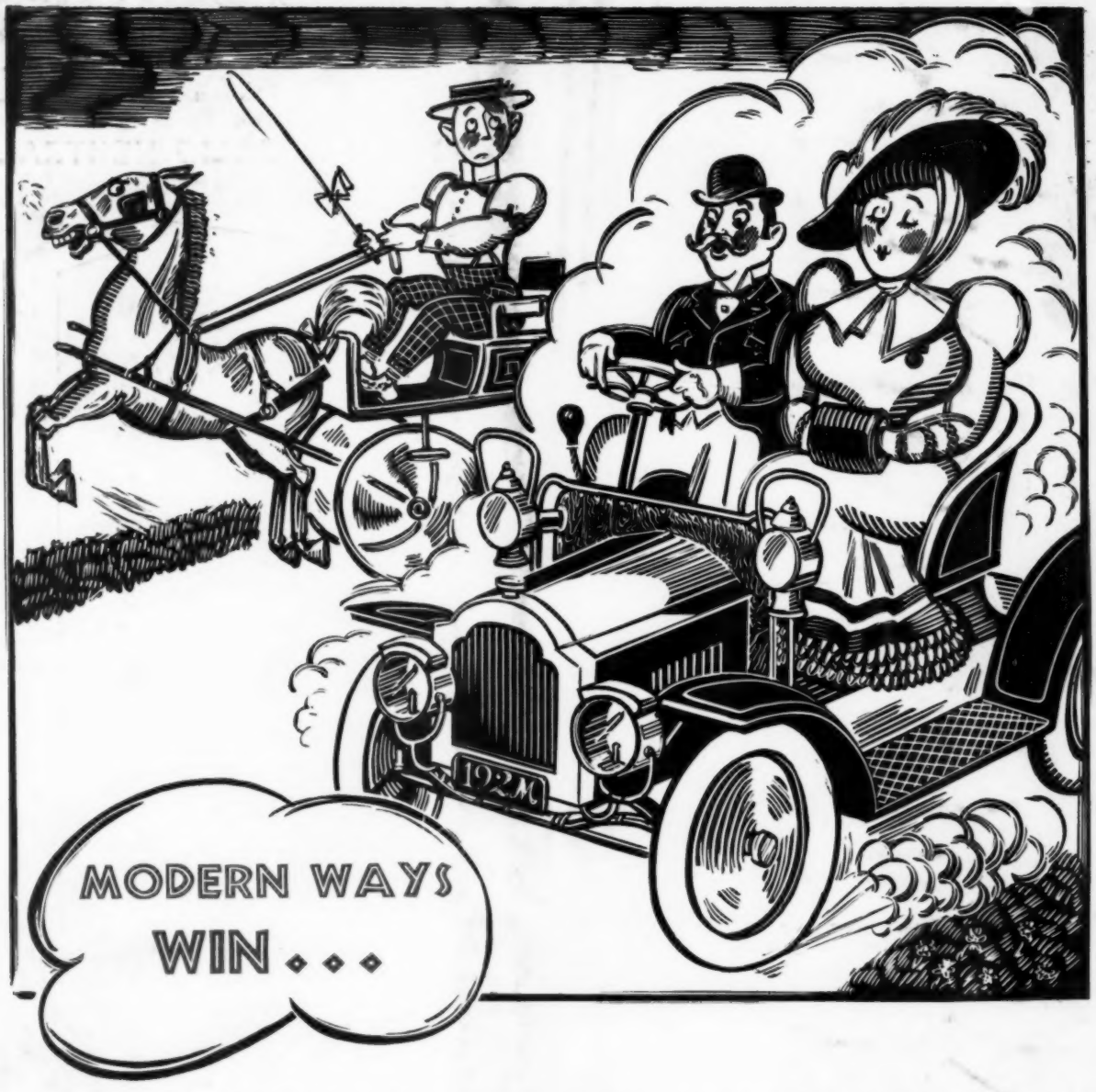

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